R R Kelly Esq
59 Mark Lane E.C. London.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXV. No. 631.] LONDON, JUNE 15, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL
COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1694. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 69, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

PROUD'S
SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
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COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
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Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Coal Office,
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THE OLD TUBE-WORKS, WEDNESBURY,
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
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COMMERCIAL STREET, SPITALFIELDS;
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J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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WET AND DRY GAS-METERS,
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Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
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For the English Government, and for the Government of the Netherlands;
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Presented by Her Majesty's Government to the French Government;
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DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
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G. G. and Co. have just received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

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N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

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INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

THE

LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON STREET, OLDHAM,

MANUFACTURERS OF

GAS-METERS, GOVERNORS, EXPERIMENTAL GASHOLDERS, &c.

HENRY THOMAS, Managing Director.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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WAREHOUSE: SOUTHWARK STREET, LONDON.

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PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

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TUBES and FITTINGS for GAS, STEAM, and WATER;

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AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

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EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.

Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

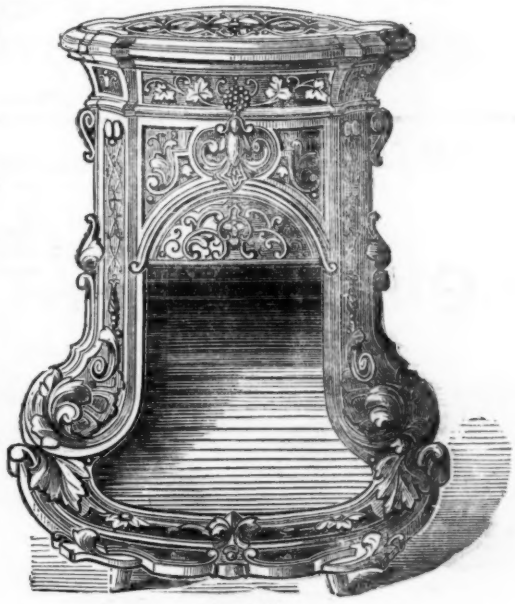
BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.



No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,
Has all the appearance of a Bright Fire.
PRICE from 32s.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON. } Joint Managing Directors.

1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

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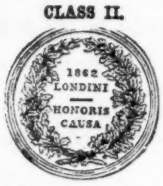

This Paint having been in general use over thirteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced or resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS; BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

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Drawings and Prices upon application.

PRIZE MEDALS—1862, 1867, 1871, 1874.

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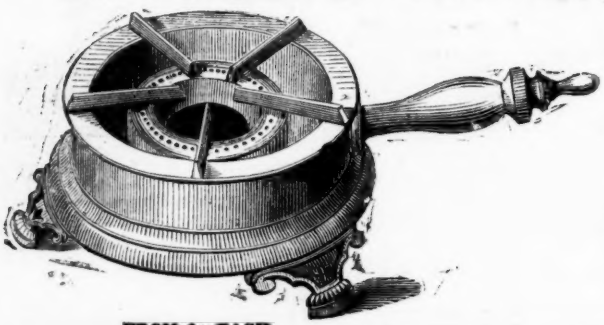
SOLE LICENSEES AND AGENTS FOR GREAT BRITAIN FOR

GIROUD'S PATENT RHEOMETER.



FROM 3s. EACH.

This Instrument is easily fixed under any Burner; it regulates the volume of Gas to be consumed, notwithstanding the Size of the Burner or the Variation of Pressure.

Full particulars on application, also Pamphlets on the "ADVANTAGES OF COOKING AND HEATING BY GAS." With Illustrations, &c., of the latest and most improved

GAS KITCHENERS, GRILLERS, COOKING STOVES, REGISTERED BOILING STOVES (See Margin); also the NEW SAFETY PATENT TUBULAR GAS BOILERS.

LIBERAL TERMS TO THE TRADE.

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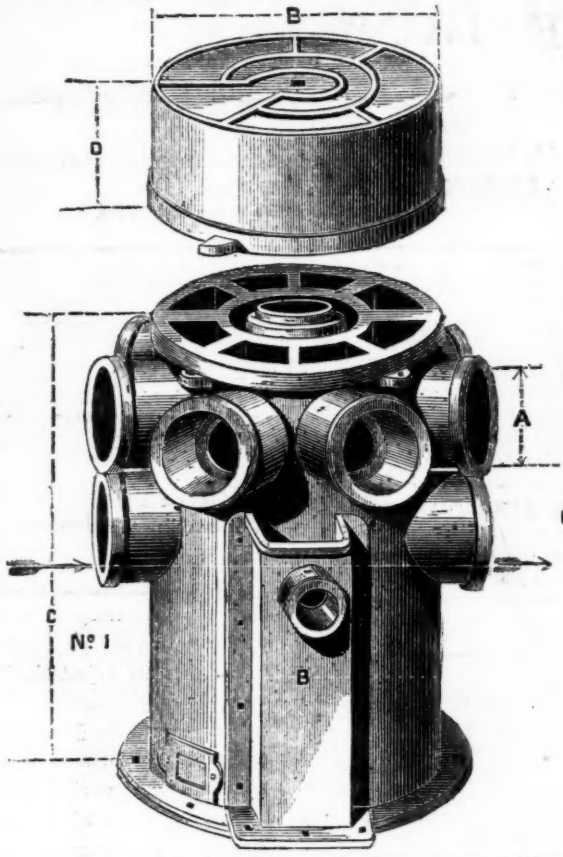
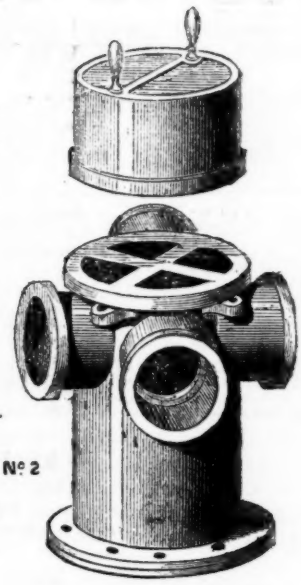
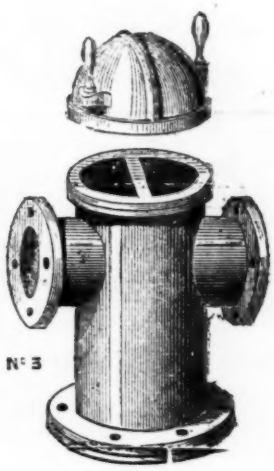
MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.







THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4	5	6	7	8	9	10	12
B. Diameter of Body.	16	20	23	26	28	31	34	40
C. Height of Tank .	33	35	38	43	46	48	51	56
D. Depth of Cover .	8	9	10	11	12	13	14	16
Total Height . .	44	44	48	54	58	61	65	72

In all cases the Covers are cast heavy enough to resist any required pressure.

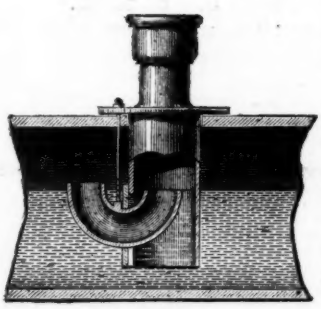
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



DIP-PIPE, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

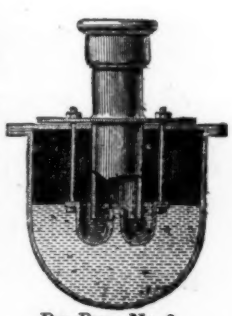
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



DIP-PIPE, No. 2.

FOR PRICES, TESTIMONIALS, &c., APPLY TO

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

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Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

M. SELIG JUNIOR AND CO.,

IMPORTERS OF

AMERICAN AND OTHER FOREIGN TOOLS AND MACHINERY,

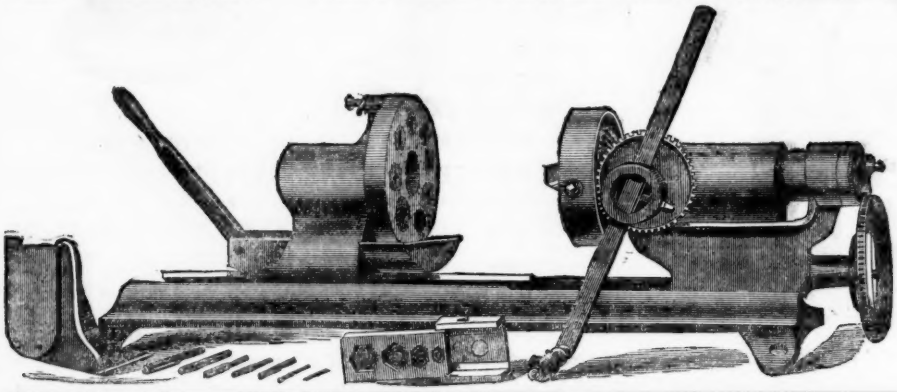
WHOLESALE AND EXPORT MACHINERY MERCHANTS,

SOLE EUROPEAN AGENTS FOR THE

"TANITE" COMPANY'S SOLID EMERY WHEELS AND MACHINERY,

85, QUEEN VICTORIA STREET, LONDON, E.C.

THE "LIGHTNING" HAND AND POWER SCREWING AND TAPPING MACHINES.



They finish their work at one cut.

Nuts and bolts threaded with them always correspond, without trying and fitting.

The dies are adjustable for wear.

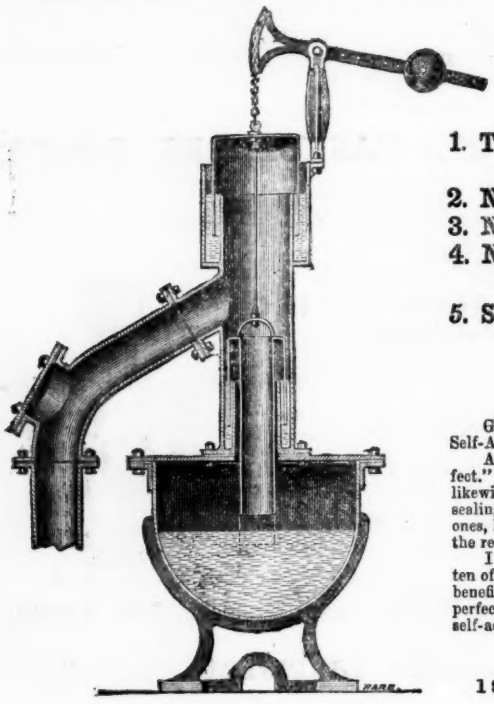
They thread 30 ¾-in. bolts, and tap 30 ¾-in. nuts, in 40 minutes—a day's work by hand.

They may be used, if pipe-dies ordered, for threading pipes as well.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

19, GREAT GEORGE STREET, WESTMINSTER.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

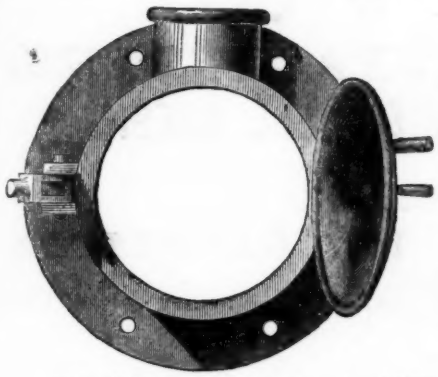
SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS,

ANTI-FRICTION CATCHES, AND ECCENTRIC FASTENINGS.

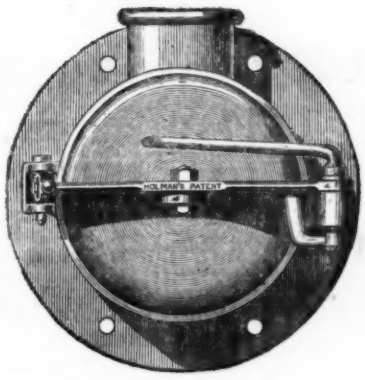


NO LUTING.

NO DUPLICATE LIDS REQUIRED.

INSTANTANEOUS SEALING EFFECTED.

HOLMAN'S NEW SELF-SUSTAINING CROSS-BAR ENSURES FREEDOM OF JOINT AND MAINTAINS PARALLEL POSITION OF THE LIDS.



Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), nearly 15,000 being in use at various Gas-Works in London and the Provinces, among which may be mentioned:—

The Gaslight Co., Beckton (where, by the end of 1875, nearly 4000 will be in use).
" Gaslight Co., Bow Common.
" Gaslight Co., Silvertown.
" Gaslight Co., Lupus Street.
" London Gaslight Co.
" Independent do.
" Phœnix do.
" South Metropolitan Gaslight Co.
" Commercial do.
" Imperial do.
" West Ham Gas Co.
" Gas-Works, Barnet.

The Gas-Works, Royal Arsenal, Woolwich.
" do. Lower Sydenham.
" do. Brentford.
" Consumers Gas Co., Woolwich.
" Alliance and Dublin Gas-Works.
" Edinburgh do.
" Manchester Corporation do.
" Salford do. do.
" Rochdale do. do.
" Liverpool Gas-Works.
" Birmingham do.
" Birkenhead do.
" Nottingham do.

The Newcastle-on-Tyne Gas-Works.
" Lurgan do.
" Carmarthen Gas-Works.
" Merthyr Tydfil do.
" Windsor do.
" Leeds do.
" St. Albans do.
" Over Darwen do.
" Rotherham do.
" Aylesbury do.
" Bournemouth do.
" Ystrad do.
" Cardiff do.
" Rochester do.

The Keighley Gas-Works.
" Aberdare do.
" Ballymena do.
" Richmond do.
" Stalybridge do.
" Longton do.
" Exeter do.
" Ross do.
" Falmouth do.
" Barrow-in-Furness do.
" Belfast do.
" Wakefield do.
And other Provincial and Foreign Gas-Works.

IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (Commonly called the Chartered Gas Company), Beckton, North Woolwich, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

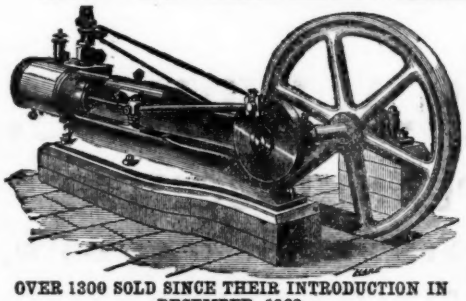
Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,
(Signed) G. C. TREWBY.

TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE

STEAM-ENGINES.



OVER 1300 SOLD SINCE THEIR INTRODUCTION IN DECEMBER, 1869.

In designing this Engine the utmost regard has been paid to simplicity of arrangement, strength of construction, and economy in cost. The working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact, the bed-plate, front cylinder cover, guides, and plummer-block for crank-shaft bearing being all cast in one piece, which in design and proportions is admitted by competent engineers to be perfect, and to afford a strength and rigidity that cannot possibly be attained in the best fitted engines of the ordinary horizontal type. The extraordinary stiffness of this Engine will permit of its being driven at a much greater maximum speed than engines generally, and with far less wear and tear. The cylinder with its valve-chest is bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

These Engines are adopted in Gas-Works at Greenwich (Phœnix Gas Co.), Haggerston (Independent Gas Co.), Nine Elms (London Gas Co.), Falmouth, Harrow, Jersey, Plymouth, Richmond, Rochdale, Santiago (Chili), &c.

NUMBER . . . . . NOMINAL HORSE POWER	B 2	C 3	D 4	E 6	G 8	H 10	J 14	K 18	M 25
Price of Engine, with Governor	£32	£38 15 0	£46	£70 0 0	£90	£115 0 0	£145	£185	£200
Feed-Pump, extra	3	3 15 0	4	5 10 0	6	7 10 0	8	10	15
Engine and Vertical Boiler on Base-Plate	75	95 0 0	110	150 0 0	180	225 0 0	280	—	—
Engine and Cornish Boiler, with Fittings	—	—	—	—	—	—	—	—	—
Variable Expansion Gear, extra	—	—	10	12 0 0	13	14 0 0	15	16	18

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 15, 1875.

Circular to Gas Companies.

The very important announcement made by the chairman of the select committee on the Metropolis Gas Companies (Regulations) Bill on Friday, must materially affect the prospects of the measure. After hearing the case of the promoters, and having attentively listened to everything that could be said against the management of the two largest companies, the committee unanimously came to a conclusion adverse to the proposal made in the sixth clause. Mr. Forster said the committee had fairly considered the arguments and evidence of the promoters of the Bill, but neither the arguments nor the evidence had convinced them that it would be fair to the producers, or advantageous to the consumers, of gas, to fix a price above which the dividend should be diminished, while below that price it should not be increased. The committee considered that the objections to this proposal are not removed by the new clauses (48*a* and 48*b*) introduced by the promoters of the Bill. The committee would appear still to leave it open to the promoters to adopt Mr. Farrer's suggestion, which, indeed, they had, through Mr. Cripps, expressed their willingness to do.

We gather from the speech of Sir E. Beckett that the "associated companies" object to any sort of sliding scale of dividend; and so, in fact, do we. We only support the up-and-down scale as a simple measure of fairness. If a company are to be fined (for that is what it practically comes to) when they exceed one price, it is but just that they should be rewarded when they make another and lower charge. That there would be an outcry if a company divided more than 10 per cent. we do not for a moment doubt. We have a fear that gas companies will never give perfect satisfaction to the public, and certainly never to the vestrymen and common councilmen, who make capital by abusing them. We need not stop, however, to discuss this matter further.

The Metropolitan Board yesterday morning agreed to adopt in full the proposal of the Board of Trade as to the up-and-down sliding scale; but, of course, the select committee will express their opinion as to the propriety of its adoption. Supposing the proposal to be accepted, it must follow, as we have already shown, that, unless this system is to be worked to the exclusive advantage of one or two companies, a differential "standard" price must be fixed. For example, the South Metropolitan and Independent Companies should have a considerably lower standard price than the Chartered and Imperial Companies. It follows, then, that the present inequalities of price must be continued, and that the sole advantage that the metropolis will derive under this Bill, if it should pass, will be an uniform standard of illuminating quality; uniformity of purity, as well as of price, being unattainable.

The great object of the Metropolitan Board is to get rid of the revision clauses of the Acts of 1868–1869. It is not much to the credit of the Board that they show such antagonism to these clauses. If there had been a great fall, instead of a great rise, in the price of coal, in 1872, the revision clauses might have been used with effect against the gas companies. As it has turned out, however, only the companies have had to apply for revision. A song of triumph would have been raised by the Metropolitan Board if they had been successful in an application for a reduction of price; but their opportunity never came, and now they are disgusted with the operation of the double-edged weapon they assisted in forging. We must wait to see what form any substitute for clause 6 will take, but we must once again protest against the standard price of 3s. 9d., if anything in excess of that charge is to reduce dividend.

One of the Labour Laws Amendment Bills, introduced by the Home Secretary on Thursday, is of some importance to gas companies and municipal authorities having gas-works. In general, Mr. Cross is in favour of making a breach of contract on the part of a workman a matter for civil proceedings. But he acknowledges that there are cases in which a breach of contract may involve a great public danger, and which may be justly regarded as a crime. He, therefore, proposes that, wherever a workman is employed by a municipal body or public company, upon whom is imposed by Act of Parliament the duty of supplying gas or water, and that workman wilfully and maliciously breaks his contract of service, knowing, or having reason to believe, that the probable consequence of his doing so, either alone or in combination with others, would be to deprive the inhabitants of the city or district, or the greater part of them, of gas or water, such a breaking of contract shall be regarded as a special offence. This is obviously intended to meet such a case as the strike of the gas stokers, whose openly avowed intention it was to place, if they could, the whole metropolis in darkness. The desire was diabolical, and the execution would have been a most criminal act. We must, therefore, express an unqualified approval of the distinction made by Mr. Cross. Lord R. Montague, who would be a socialist, if he had the pluck to shake himself free from aristocratic trammels, and would, indeed, be anything to keep a seat in the House of Commons, expressed an opinion that the criminal measure, if passed, would, in the case of gas and water companies, place the workmen completely at the mercy of such companies. For ourselves, we may say that, yielding to no one in the desire to see the mutual relations of masters and men placed on an equitable footing, we see no hardship at all in compelling a man to fulfil a contract he voluntarily entered into, or in his being sent to prison, if the breaking of such contract involves, as Mr. Cross puts it, a great public danger. We do not anticipate that any successful opposition will be made to the Bills of the Home Secretary, and all we need point out to companies is the advisablity of carefully framing contracts, and steadily enforcing contract service.

It is always an unpleasant duty to find fault with the decisions of Judges, and to some it may appear presumptuous in us to do so. We must nevertheless call attention to the judgment of Justices Lush and Quain in the case of the Commercial Gas Company against Scott, reported in another column. The proceedings were taken under the Gas-Works Clauses Act, 1871, and the case turned on the applicability or not of this Act to the metropolis. The Act received the Royal Assent on July 13, 1871, and the third section enacts, "That the provisions of this Act "shall apply to every gas undertaking authorized by any special "Act *hereafter* passed, or by any Provisional Order made under "the authority of the Gas and Water Works Facilities Act, 1870," &c., &c. To get the metropolis under the Act of 1871, the judges rely on section 1, which says that "the Gas-Works "Clauses Act, 1847, and this Act shall be construed together as "one Act," &c.; but this we humbly submit is only when both Acts are applicable. The point may not be worth contesting by the Commercial Company at the present time; but we hope that, if like circumstances arise, no other company will accept the decision without challenge. If the law be as now laid down, we have in the Act of 1871 an example of retro-active legislation, without a parallel, we rather think, in our jurisprudence.

The Corporation of Limerick are very "hard up," and, like all impecunious Corporations and individuals, they are anxious to borrow money. To account for their impecuniosity, they had the other day to tell the Chancellor of the Exchequer some tales of the good old Corporation days, when the members quietly divided public property among themselves. Thus alluvial and other valuable land was let to members for merely nominal rents, from 6d. to 1s. an acre, on leases ranging from 99 to 999 years. They

also leased the Shannon fishery for 99 years for £300 a year, the lessee immediately disposing of his interest for £10,000—a fine stroke of business for an alderman or common councilman. In this way the income of the Corporation, which ought now to be £12,000 a year, has been reduced to only £1200. The above, however, is not much to our purpose. The fact we wish to call attention to is that the Corporation have incurred a debt of £24,000 for gas-works, by which they say they have reduced the price of gas from 10s. to 5s. There would be some satisfaction in this statement, if it were not known, on the authority of one of their own body, that, to effect this reduction, the Corporation had realized a loss of £33,000 up to two or three years ago, and must since then have considerably added to their loss. This result may well serve as a caution to all municipal bodies who are inclined to start competing gas-works. The Corporation of Limerick went to the Government for a loan of £36,000 to pay off a debt of £60,000; but the Chancellor of the Exchequer could hold out no expectation that their wishes would be complied with.

Mr. C. G. Cleminshaw has not been called to give evidence on the metropolitan gas question, but he has rushed into lithography with a letter, affectionately addressed to some "dear sir," with whose patronymic we are left unacquainted. The letter is professedly a reply to the communications of Mr. R. Ekyn and Mr. Chubb, which appeared in the City article of *The Times* last month, but is mainly an attack on what is called the system of connecting capital with dividend, under which, the writer says, that one company can charge 5s., whilst another is satisfactorily remunerated with 3s. 4d. per 1000 feet of gas. But then, as he says, one company may have a capital of £8 per ton of coal carbonized, while another has only a capital of £4 10s. This is a fact, but the blame does not rest with the companies; it must be laid on the law, which will not allow the redemption of share capital. If companies had had the power of paying off share capital by means of a sinking-fund, as Corporations can borrowed money, these inequalities of capital might never have arisen. Mr. Cleminshaw puts the case of a company starting with a capital of £100,000. He says that, no provision being made for renewals, this capital would practically disappear in the course of 34 years, when another £100,000 would be required, and the capital of the company being now £200,000, it would be necessary to raise the price of gas. We may accept this somewhat rough statement of the case, and say that as the law stands it is inevitable. A company must, of necessity, go on adding to capital, and it is not to be expected that they shall accept as lost what is in reality no longer productive. The remedy for the present state of things would be to permit the companies to raise money by bonds at a fixed rate of interest, and to allow, at the same time, a sinking-fund for the gradual redemption of them at par. Under such an arrangement, we have no doubt the companies could raise money at a comparatively low rate of interest, and make no permanent addition to their capital. Mr. Cleminshaw is in favour of Mr. Beal's scheme for putting the gas companies under the goverment of a Royal Commission. This scheme would satisfy neither companies nor local authorities; but we cannot stay now to raise objections. In leaving Mr. Cleminshaw, we may congratulate him on the good sense displayed in the final sentence of his letter. "The "companies," he says, "have the right to be fairly treated, as, "however extravagant their investments may have been, they "have been made with the sanction of the community, as repre- "sented by Parliament."

The British Association of Gas Managers have had a very successful meeting at Leeds. The attendance of old members was unusually good, and no fewer than 58 members were added to the roll of the association. The pressure on our space prevents us from giving to-day little more of the proceedings than the eminently sensible and practical inaugural address of the president of the year, Mr. Paterson. We may commend the address to the attentive perusal of many of our readers who are not gas managers.

The Southampton Gas Purchase Bill has been withdrawn from the House of Lords for the present session, in deference to a vote in the Town Council. There seems to be some doubt whether the directors of the gas company will quietly submit to the cancelment of the agreement made with the mayor. It is possible, therefore, that we may hear of some legal proceedings in connexion with this abortive business. For our own part, we are disposed to think that the directors might be well content to retain their undertaking, and leave the matter as it stands.

Our readers will remember that, in March last, a committee of gas consumers was formed in Birmingham, to discover the causes of the great increase in the charges for gas made during the last quarter of 1874. That committee have just made a report, and, although it contains grave charges against one of the companies, we can have no hesitation in giving its substance. In an early stage of the inquiry, it seems to have been ascertained that the increase applied almost solely to the Birmingham and Staffordshire Company, and accordingly the secretary of that company was written to for an explanation. We have already published the explanation, which was to the effect that inclement weather and dark days had led to a largely increased consumption. It is denied that the weather was inclement and the days dark, but the committee state that they have positive evidence that inferior coal was used, and that, by leaving open a bench of retorts, a large amount of atmospheric air was mixed with the gas, and the illuminating power thereby deteriorated. The returns of the borough gas inspector are quoted, which show that while, in the last quarter of 1873, the gas supplied by the company averaged in illuminating power 15·75 candles, it fell in the corresponding quarter of 1874 to 14·43 candles, and was on one occasion as low as 12·66 candles. It is further stated, that since the complaints were made, the gas has gone up to an average of 15·50 candles. It is no part of our business to defend gas companies in wrong-doing, even when they are in such straits as the Birmingham and Staffordshire Company were last year. Still, we do not see that the consumers have so very much to complain of. It is admitted that the gas was seldom below the legal standard, and the example should serve as a warning to companies never greatly to exceed their standard. The Birmingham and Staffordshire Company have in past times been very liberal, and have rendered the borough a great service, and we can only regret that in the last moments of their existence a difference should have arisen between them and their customers.

Water and Sanitary Notes.

We read that a conference will presently be held with a view to the establishment of a combined sanitary authority for the Thames Valley. The formation of such an authority is highly desirable, not only for the valley of the Thames, but for the drainage areas of all our large rivers. It is, in fact, only by combined operation that effective drainage can be carried out. We have so often remarked on the fast-growing necessity for mapping out England into areas for drainage and water supply, that we need say nothing here in favour of the object of the conference. The question will arise, as soon as the combined authority is formed, what system of drainage shall be adopted; and as regards this, Sir J. W. Bazalgette comes forward with a suggestion. A few years ago this eminent engineer proposed to divert all the sewage flowing into the Thames between London and Windsor by intercepting sewers, and carry it to Bagshot Heath. The scheme encountered much opposition, chiefly, we believe, on the ground that sewage farms had not been found to be remunerative. Subsequent experience has not removed this objection, and it is now proposed to construct a sewer, following the line of the Thames, to convey the sewage of these upper towns to a point many miles below London, and there discharge it into the river. The objections to this plan are those which apply generally to the present mode of disposing of the sewage of the metropolis, and the chief is the waste of manurial matter. This waste must be looked on with unfeigned regret, but, with our present knowledge, it seems unavoidable.

It is gratifying to learn, on no less authority than that of Sir F. Nicholson, the deputy-chairman of the Thames Conservancy Board, that within a short time the whole of the sewage between Mortlake and Woolwich will be diverted from the river by the Metropolitan Board of Works. Above the intake of the metropolitan water companies, it seems that there are now only four towns which discharge sewage into the river, and three of these have works in progress for its diversion or purification. The fourth, we may say, are considering. They have considered for some years, but it is likely that some action will soon be taken; and when the works contemplated are in action, the Thames, in its upper part, will be free from untreated sewage.

Liverpool, the second city in England, and the future seat of Government, some say, has not yet settled the question of the water supply of the future. The Water Committee have drafted a report, not yet submitted to the council, in which they are said to recommend the adoption of Mr. Jackson's Bleasdale and Wyresdale scheme, as approved by Mr. Hawksley. The chief objection to the adoption of this project appears to lie in the fact that, at the present moment, some thirty towns and villages draw their water from the district which it is proposed to appropriate to the supply of Liverpool only, and hence a most determined opposition to the scheme must be anticipated, not only from these towns and villages, but from numerous millowners who have now the use of the waters. The execution of the scheme, it is also alleged, will cost much more than has been estimated, some putting the outlay at six rather than two millions of pounds. Mr. Bateman's Ullswater scheme does not seem to attract any notice from the Water Committee. Under these circumstances, it is

not surprising that many in the Town Council regard with most favour a proposal to sink more wells. They know that in seasons of drought the wells have to be relied on to keep up the supply, and it is alleged that whereas a scheme which will bring to Liverpool a million gallons of water a day from a distant watershed, will cost from £116,000 to £124,000, the same quantity of water can be obtained from additional wells at a cost of from £30,000 to £40,000. In connexion with this, the Town Council will do well to remember that the present wells show evident signs of failure, and that additional sinkings into the same formation, which has but a limited area, can only hasten the exhaustion of the subterranean supply. The ten additional wells proposed would, no doubt, answer the purpose of Liverpool for some years to come; but, if the population progress at the rate estimated, the Town Council cannot long postpone the consideration of some very extensive gravitation scheme.

Correspondence.

HARCOURT'S "BISULPHIDE TEST."

SIR,—Will you allow me to state, in your columns, in answer to several inquiries, that I have made arrangements for the sale of the "bisulphide test," which I showed at Leeds recently, by Messrs. Walker and Son, Littlegate, Oxford.

June 12, 1875. A. VERNON HARCOURT.

RIGHTS OF GAS COMPANIES.

SIR,—In regard to the query of your correspondent, "Provincial Manager," "as to the rights of gas companies to be paid *in full* in cases of any kind of insolvency," I have a strong opinion upon the matter, and that is that they have *no such right*, and I venture to challenge the production of any section in any general gas Act (and I think in any local and personal Act), giving them a preferential claim over every other creditor. The preferential claims are those which run with the land, and may easily be counted up on one's ten fingers—viz., rent of every description, even to that of a superior landlord, when *no* rent is owing from the occupying tenant, nor from his intervening leasehold landlords, four or five upwards, fines and hereditaments upon copyholds, quit-rents, fee farm-rents, ground-rents, of course, *et hoc genus omne*, tax on land (Mr. Lowe has provided artfully for payment of assessed taxes in advance), and there may be some others. But, in regard to all other claims, they are *personal*, and attach to the *debtor alone*. Upon the failure of the debtor to fulfil his engagements, all claims under this head, however temptatiously named, as "income-tax, gas-rent, water-rate, poor and other rates," will all fall into the same category with the butcher, or baker, or trade creditor. Of course, by the statutes relating to cases of insolvency, servants wages, for not more than a limited period, are to be paid in full; and so, likewise, under certain health of towns Acts, the sanitary authority may have power to order a *compulsory* supply of water to certain poor tenements for health purposes, and then to distrain upon the rent accruing to the creditors of an insolvent landlord.

It will be borne in mind that, in the eye of the law, the instant that the debtor commits an act of bankruptcy, makes an assignment, or goes into liquidation either voluntarily or by compulsion, he becomes commercially *dead*; and although his former property (even to the gold watch in his pocket) may appear to be in his disposition and power, yet it is in nowise *his own*, and he acts only as a servant for his creditors benefit. The Acts of 1847 and 1871, or any special Act which prescribes "that any consumer shall pay for any gas he has consumed," only re-enacts the common law, which says that any man buying 100 bales of wool shall pay for them, but does *not* prescribe that his creditors are to pay for them. The instant that the debtor becomes insolvent, the whole character of the transaction is changed. The supply of gas to the defaulter is, after due notice, to be cut off; and if in the metropolis, the trustee, or the assignee, or the receiver, has a right to demand a *fresh* supply for *himself*, under the Metropolis Gas Act, 1860, section 14, leaving the gas company the sweet chance of receiving one-eighth of a penny in the pound under the liquidation. The whole course of legislation is in this direction—viz., as soon as any sort of insolvency takes place, the remaining assets are to be shared rateably among the creditors. Even the sheriff in execution for debt is immediately turned out, and even an ordinary trade payment, made a short time *previous* to the insolvency, is to be returned if tinged with the slightest taint of fraudulent preference.

Now as to the legal decision confirming the above. I had distrained on the goods of an insolvent consumer under deed of composition. The creditors paid me out under protest, and immediately sued us in the county court in "trover," for money had and received "for their benefit." The facts were undisputed, the question was a bare legal point. I contended that the goods were "in the order and disposition of the insolvent," and therefore liable to distraint for gas-rent. I succeeded against a strong legal array. But the creditors moving for a new trial obtained it, and the judge reversed this decision, and our company were obliged to refund the money. With the view of a further appeal, I consulted counsel and solicitors, who held that the last decision of the judge was good law. The judge was no mean authority, a good lawyer and a man of strong common sense, George Clive, Esq., now M.P. for Hereford and formerly Under-Secretary for the Home Department.

I would strongly urge upon secretaries and collectors to be more urgent in not allowing arrears to accumulate, and especially to mark with a black mark those costermongers who openly defy you and say, "I know the worst you can do—cut it off, and then I will pay you. The money is worth more to me than to you." And likewise those deceased mayors who were also M.P.'s, and other M.P.'s who *covertly* defy you and dispute every account, and will never pay any account until they have received a lawyer's letter (you cannot cut off and distrain upon these gentry), and who threaten you with a speech in Parliament about your being "insolent and uncivil."

I would also strongly recommend them to cut off the supply *inside*, and distrain under the 16th section of the 1847 Act, followed by the Incorporated Railways Act (8 Vict. cap. 20, sections 145-9). I acted upon a similar section in an old incorporation Act for more than 30 years, and I never got into trouble, except as hereafter named. We scarcely ever actually levied; the fear of it, or of the man left in possession, was always sufficient to bring the money. Sometimes we were met by a notice from the landlord that there was more due for rent than the goods would fetch. If we doubted it we could pay him out, and levy for his rent as well as for our gas-rent. Sometimes we were met by a notice that the goods were held under a bill of sale, or under a marriage settlement, or a composition deed. In all these cases we endeavoured, if possible, to ascertain the *bonâ fide* character of the holding, and in most cases to show the most *discreet* part of valour by "running away."

I made it a point never to summon or distrain for a *disputed* account, and, of course (after 1847, although our company was not under that for years), for more than £20. Therefore the magistrate never had any case to investigate, but merely said, "Then why do you not pay for your gas? I must issue the warrant;" and he declined to interfere either for delay or poverty, but referred the defaulters over to the company. Cases of distress, when the gas was cut off and the defaulters had removed, were always met liberally by forgiving the debt. Cases of temporary misfortune had sometimes delay granted, the gas being cut off; and cases of affluence and insolence were always rigorously enforced. Our summons, order, and two forms of distraint were settled by the then counsel, the late judge, Sir James Erle, and also by the late judge, Sir William Bodkin.

The only case where we got into trouble was one where we had distrained without first summoning. We allowed judgment to go by default, and at the assizes, before the under-sheriff, we compromised by paying £20 damages, and, of course, all costs.

At the commencement of my secretariat, we left no bill nor particulars of our demand, we left no notice to cut off, nor notice to distrain. The gas was cut off in the road without formal application for the amount again, and at the same moment an affidavit of the debt was made before the magistrate, behind the back of the defaulting gas-renter; and, at the same moment, a man was left in possession, in execution for the amount.

Of course, with my good tact and *savoir faire*, I swept all that away the instant I came in. I insisted upon three demands with printed notices; three printed applications sent by post, increasing in urgency, and giving notice as to proceedings; the collector calling to demand when the gas was cut off inside; the reinstatement of the supply before night, without expense, if the amount were paid; the delay for a week before expense was incurred by cutting off in the road. Then, as to distraint, another formal demand, the summons, the order to pay, and finally the execution, where virtually the man *never* levied or removed. Our bad debts were 15s. per cent., and our arrears far less.

AN EX-SECRETARY.

RIGHTS OF WATER COMPANIES.—The *Sheffield Daily Telegraph* says: "We are informed that the water company have initiated a new course of action with respect to cases in which they find themselves to be the creditors of persons who have filed petitions for liquidation or in bankruptcy. Up to recently it had been the practice of the company to prove for the amount owing to them, in common with other creditors; but, in several instances within the past few weeks, they have adopted the more stringent course of cutting off the supply, with the intimation that it cannot be resumed unless the amount owing be paid in full. This mode of procedure is difficult for the trustees or receivers appointed by the court to deal with, inasmuch as they have no power to comply with the company's demands to that extent. It is, therefore, intended to test the question, in order to ascertain whether the company are justified in their action or not; and, in one particular instance, a legal notice has been served upon the manager, requiring a pipe to be connected with the company's service-pipes within a specified time. A number of other cases will depend upon the decision in this one, the matter generally being of considerable interest to the commercial section of the community."

SUPPLY OF WATER AT FIRES.—At the meeting of the Metropolitan Board on Friday last, a letter was read from the Local Government Board, stating that their attention had been drawn by the directors of the East London Water-Works Company to the correspondence which has taken place between them and the board, relative to the alleged inadequacy of the existing arrangements for obtaining a water supply in cases of fire in the metropolis; and inquiring whether the board have had under their consideration the correspondence referred to, and, if so, whether they contemplate taking any further action in the matter. The communication was referred to the Works Committee.

REDUCTIONS IN THE PRICE OF GAS.—At the annual meeting of the Market Harborough Gas Company, on Monday week, it was resolved to reduce the price of gas to 4s. 7d. from the 1st prox. The Kibworth Company have reduced the price from 6s. 8d. to 6s. The directors of the Wishaw Gas Company announce a reduction from 6s. 8d. to 5s., after the next inspection of meters. The Knaresborough Improvement Commissioners, at their meeting on the 7th inst., confirmed the minutes of the Gas Committee, recommending a reduction from 5s. to 4s. 2d. from the 1st prox. At Redruth the price of gas was reduced last September to 5s. 9d. and 6s., and a further reduction is announced for the Midsummer quarter, making the net price 5s. 3d. and 5s. 6d.

SOUTHWARK AND VAUXHALL WATER COMPANY.—The half-yearly general meeting of shareholders was held at the office, Sumner Street, on Thursday, the 10th inst., when the following report of the directors was presented:—"The directors beg herewith to submit to the proprietors the half-yearly accounts of the company to Lady-day, 1875, which have been duly certified by the public auditor appointed by the Local Government Board, and by the auditors of the company. The state and condition of the company's works continues to be satisfactory. The new works which the company are constructing at Peckham and Hampton are now almost completed. A measure for the purchase of the metropolitan water companies has been brought before Parliament by Colonel Beresford, but has not yet come before the House for discussion. The terms of the proposed measure not being favourable to the company, the directors have determined, in concert with the other metropolitan water companies, to oppose the second reading of the bill. The inquiry into the question of the water supply to the Richmond district has at length been brought to a conclusion; but the Government inspector has not yet issued his report. From the satisfactory nature of the evidence brought forward, the directors feel convinced that this report cannot but be favourable to the company. The increase of the company's water-rates in charge for the half year to the 31st of March, 1875, continues to be satisfactory. The directors recommend that a half-year's dividend, at the rate of £5 5s. per cent. per annum, on the ordinary stock and class D shares; £5 per cent. per annum on the preference stock and on the amount paid on the preference shares; and £4 10s. per cent. per annum on the ordinary shares and on the instalments paid on the new ordinary No. 1 shares—be declared payable on the 15th of July, 1875.

Parliamentary Intelligence.

METROPOLIS GAS COMPANIES BILL.

On Monday, the 7th inst., the CHAIRMAN intimated, at the commencement of the proceedings, that the committee would think it right to call before them one or more of the Revision Commissioners before the close of the inquiry. It would be better that these gentlemen, who were officers of the Government, should be called by the committee, than that they should be made the witnesses on either side.

Mr. *A. Gunn*, accountant of the Metropolitan Board, was called, and stated that he had for some time past given particular attention to the accounts of the metropolis gas companies, and was examined in 1873 and 1874, before the Revision Commissioners, with regard to their finances. He had made an approximate estimate (which was handed in) of the population of the districts lighted by the nine existing companies. That estimate was based on the census returns of 1871. The total population was 3,206,812. He also handed in a table, showing the "quantity of gas in thousands sold by the companies" in the years 1869 to 1874 inclusive, and "the amount in pounds of 1d. per 1000 feet" produced by each company. A further table, prepared by him, was put in, showing the share capital and maximum dividend of each of the companies, from which it appeared that on Dec. 31, 1874, the share capital actually paid up amounted to £8,880,703. There was also a loan capital at various rates, from 4 to 5 per cent. (including bonds for capitalized profits in the Imperial Company of £130,000, at 10 per cent.), of £1,734,512. The total of the uncalled capitals amounted to £1,602,197 in shares, and £292,312 on loans. Witness deposed to the proceedings before the Revision Commissioners, and the results, and he expressed an opinion that, although in ordinary undertakings there was a stimulus to keep down the issue of capital, from the present machinery under which gas companies worked there was a positive encouragement given to the creation of new capital. A private trader, if he overweighted his concern, would suffer, because his profits would be less; but the gas companies could lose nothing, even if they were overweighted with capital, as the Revision Commissioners would be bound to give 10 per cent. on the capital. It was impossible, with the information which a body like the Metropolitan Board of Works had at its command, to come before the Revision Commissioners criticizing the working of the companies. The information was entirely in the hands of the companies, and there was no sort of proportion at all between one year and another. Then, with regard to the raising of capital, in the case of gas companies there was no tribunal coming between the consumers, who had to pay the whole of the dividend upon it, and the companies, who were especially interested in the creation of fresh capital, which, under existing circumstances, was issued to the shareholders, who had the benefit of the premiums the shares fetched in the market. Witness produced a table, showing the prices and illuminating power of the gas supplied by the respective companies from 1869 to 1874 inclusive.

In cross-examination by Mr. RICHARDS, witness said the Imperial Company had been for some years engaged in the construction of new works. Capital thus invested would be for some time unremunerative. Gas companies differed from railway companies as to the option of giving or refusing additional accommodation to the public. The gas companies were obliged to supply gas where it was required, whether they were inclined to do so or not. Under the Act of 1868, a public auditor was appointed by the Board of Trade, and he had the largest powers for inquiring into the working of the companies. The Metropolitan Board of Works had nothing to do with him. There was no reason to doubt that the accounts had been gone through by Mr. Parkes, than whom a more competent man could not, perhaps, be found. In the event of his discovering the accounts incorrect, either in principle or detail, he would insist upon their being rectified; and if any company considered themselves aggrieved by the act of the auditor, there was reference to an arbitrator, and, failing that, to the Court of Common Pleas, provided. Witness said he could not conceive of any clauses giving more complete powers to the public auditor than those under which Mr. Parkes acted. With reference to wear and tear, he did not say that the Metropolitan Board should have power to overhaul the books of the companies, but that before the commissioners, whoever represented the public, to question the figures of the companies, or examine them, should be in possession of the best information on the subject. When he attended before the Revision Commissioners, he was treated with every courtesy, and no question was put without being answered; yet he contended that in the very nature of the thing the present system was imperfect. A body which was not conversant with the internal working of the companies could not be said to be in possession of the most complete information obtainable, and, therefore, the revision must be imperfect. The Board of Works were perfectly powerless to say whether there had been due care and management exercised on the part of a company, and the commissioners could not say it under the present system. He did not wish to insinuate for a moment that there had not been due care and management, but his point was that there was no guarantee for information on the subject. The present state of things was illusory; the companies were encouraged in the creation of capital before it was wanted, and it was desirable that the consumers should be protected in this matter. The present bill would keep the companies within bounds, and give a thorough protection to the public. There were precedents, he thought, for the clause which fixed the price of gas on a descending sliding scale; but other witnesses would go more fully into that point. In answer to Serjeant Sargood, he said the Revision Commissioners most patiently listened to all that was brought before them, and their decision it was not for him to question.

On Tuesday Mr. *Gunn* was recalled, and further cross-examined as to the results of the inquiries before the Revision Commissioners. He admitted that the revision was strictly legal. If the principle in an Act of Parliament was that surplus profit in any ordinary year should be applied to the reserve-fund, that he could understand perfectly; but he could not believe that Parliament foresaw that in a dear year, when the Revision Commissioners had to sit, though nothing in any previous year was placed to the insurance-fund, yet in that year £30,000 should be carried to that fund. The principle of due care and management had been kept out of view to some extent. He did not, however, charge the companies with want of due care; he only said there was no guarantee for it. In his opinion, there ought to be some machinery by which the companies would be checked in raising capital before it was required, or in an improper outlay of capital for the sake of getting dividends. He thought the bill now before the committee would supply that machinery. The chairman more than once intimated that the examination of this witness should be confined to statements of facts as to the workings of the companies, and the experience of the board which he represented, and not be extended to the expression of his opinions. Witness was asked as to the restrictions to be placed on the companies in the acquisition of capital, and the advisability of requiring them to borrow from the public at 5 per cent., and stated that it was not fair, with the monopoly the companies possessed, that shareholders should have the opportunity of subscribing capital with a great premium attached to it, unless there was some benefit allowed to the consumer. Parliament, in authorizing the raising of £1,000,000 by the Chartered Company at 10 per cent., virtually made a present of £800,000 to the shareholders, for he found that the last business done was at 18 per £10 share. There was a remedy in the bill for that state of things, inasmuch as it provided that the gas companies should henceforward have no interest in raising their capital before they wanted it, and that they should raise it in moderate quantities as they wanted it. If they could save £100,000, it would then be to their advantage, just as it was to their interest now to spend as much as they could. In reply to the chairman, he said he thought the suggestion of the Board of Trade was objectionable, because it would enable the companies to pay more than 10 per cent., which, in the opinion of the Metropolitan Board, was sufficient for such a monopoly as the gas companies possessed.

Mr. *T. W. Keates*, consulting chemist to the Metropolitan Board, and superintendent gas examiner, said the provisions of the Metropolis Gas Act, 1860, had never been put in force so far as concerned the testing of the gas. The effect of different codes as to illuminating power in different Acts was productive of great inconvenience, and was very unsatisfactory. He described the progress made in the improvement of gas-burners by which the gas was tested since 1860. The gas, he added, should be tested at any time of the day or night, under the authority of the Metropolitan Board of Works or the local authority. The average of the tests during the day and night should be taken as the illuminating power. He produced a table prepared by him from returns made by various testing officers, showing the illuminating power of the gas supplied by the companies still under the Act of 1860, and a similar table showing the illuminating power of the gas supplied by the companies under the Acts of 1868 and 1869. He thought the illuminating power of the gas supplied during the daytime was not quite up to the standard. The clause in the bill relating to pressure ought to be altered so as to provide that the pressure should be taken at the testing-room instead of at the junction of the service with the main. As to impurities, he would leave it to the referees to define the amount, as in the later Acts. There was very much less impurity when the referees had the power of prescribing the standard than there was under the Act of 1869. He thought the present standard a very fair one. By not defining in the bill a hard and fast line, the consumer would have the benefit of the discoveries that hereafter might be made in the science of gas-testing. The provision in the bill that the testing should take place in the district supplied, was an improvement upon the existing provision that it should take place within 1000 yards of the works. There was a considerable inferiority in the illuminating power tested at a distance of several miles, equal to two candles, the reason of which he could not explain. In cross-examination by Mr. Richards, witness said he was aware that considerable expense had been incurred in providing testing-stations in compliance with the Acts of 1868 and 1869, and that, in all cases but two, they were situated within the districts supplied. It was the fault of the local authorities that the Act of 1860, as far as testing was concerned, had fallen into desuetude. The table he had put in showed that there was no great cause of complaint against the companies under that Act as to the quality of the gas supplied. He did not think there was any reason for attempting to obtain a greater illuminating power than 16 candles. He knew the illuminating power in some of the large provincial towns. The poor of London were never considered in any gas movement; they, as a rule, used oil-lamps. It was not true that the gas supplied to London was inferior to that supplied to provincial towns. Mr. *Heisch*, chief gas examiner to the City, was not satisfied with the present mode of testing. He thought that 16-candle gas tested by the present burner was inferior to 16-candle gas by the burner used in 1860. He had found that in testing hours the Chartered gas was always up to the mark, but out of testing hours it was not so good as it ought to be. He was not gas man enough to know the reason of the change, and he did not trouble to inquire as to the reason.

On Wednesday, Mr. *Gunn*, accountant to the Metropolitan Board of Works, was recalled, and gave the price of gas in districts immediately adjoining the districts supplied by the metropolitan gas companies. Mr. *Heisch* was also recalled, and stated that he had discovered that the illuminating power of gas could be raised two candles in the course of 30 or 35 minutes. He could not give the dates when these sudden changes took place. He did not endeavour to ascertain whether the change was a physical and chemical impossibility. He went by the engineers; of his own knowledge he knew nothing about it. Mr. *Young*, gas examiner to the corporation and to the Metropolitan Board, said he was in the habit of making tests at least three times a day at the Beckton testing station. He had frequently tested in official hours, and, speaking generally, the result had been that within the last six months he had found the illuminating power over 16 candles, but before the official testing hours it was often much below 16. The lowest illuminating power he had ever found was 12·87, at eleven a.m. on the 25th of February, 1875. Mr. *R. H. Patterson*, one of the referees appointed in 1868, by the Board of Trade, said the burner used in 1868 was the 1864, or "intermediate" burner, which gave two candles more illuminating power than the burner of 1860, with the same gas. He and his colleagues made a collection of burners from the trade, and examined those in use in several large establishments in the City where much gas was used. A considerable number of burners gave only 25 per cent. of the light of the standard burner. On an average the burners in use gave about 60 per cent. of the light of the standard burner. He thought there should be a standard burner adopted generally, just as there was a standard pint measure and a standard yard adopted.

Mr. *G. W. Stevenson* said he had been interested in the gas supply to the metropolis since 1860. The South Metropolitan Company had a large reserve-fund, and by the Act of 1869 were allowed to use it until

it was reduced to £20,000, when it was to be made an insurance-fund. Gas tested by the present burner would give four candles more illuminating power than the same gas tested by the burner of 1860. As a general rule, gas companies doubled their capital about every 10 or 12 years. He thought that 3s. 9d. for 16-candle gas was quite enough to give all the companies 10 per cent. dividend. The South Metropolitan Company did not raise the price of their gas during the coal panic, because they had a considerable reserve-fund. If they had not had a reserve-fund, they would have been obliged to charge 3s. 2½d. to earn 10 per cent. dividend. The Commercial Company were charging 4s. during the same time, and the Ratcliff Company 3s. 9d.

In opening Thursday's proceedings, the CHAIRMAN said: With regard to the time at which any witnesses that we might think desirable to be examined should be called—the allusion being specially to one of the commissioners—I have consulted with my colleagues, and we are of opinion that both sides should thoroughly state their cases before we proceed to place any witnesses of our own in the box.

Mr. *Stevenson* was recalled, and was under examination during the whole day. He said there was no clause in the proposed bill to prohibit the charge of a higher price than 3s. 9d., but there was to diminish the dividend if a higher price were charged. A provision of that kind he considered to be right in principle, as it induced due management and economy on the part of the company. The penalty under this bill would not be anything near as great as the advantage the company would reap from the increase in price. If the price were increased 3d., the Chartered Company would gain £52,000, and would suffer a diminution of 16s. per cent., which would only be equal to £23,000 in their dividends. He agreed with what had been said as to the possibility of changing the illuminating power of gas in a short space of time. He had known it increased in 20 minutes, and at a distance of 1000 yards from the works, no less than two candles. He thought it desirable, in the interests of the consumers, that gas should be liable to be tested at all times. It would be of the greatest advantage that the officers of the Metropolitan Board should have access to the books of the companies. The power of scrutiny might be limited to one month before the making up of accounts. Cross-examined, witness said the price of coal a short time ago was higher than it ever had been within the memory of man. The cost of labour had also been high, but it had now gone down, as had the price of coal. The price of labour would not affect that of gas as much as the price of coal. The metropolitan companies had not suffered from these changes in price, but the provincial companies had been left to the ordinary chances of trade, and had suffered in their dividends. The dividend had not been destroyed altogether, but simply reduced. He would explain the method in which the illuminating power of gas was increased. It was one of the commonest things in the manufacture of gas that a manager was acquainted with. If the power of the gas fell below what it ought to be, the foreman stoker, on receiving orders from the manager, at once set to work, drew some of the retorts, and charged them with cannel; the effect was immediately to increase the illuminating power of the gas; then, instead of sending it into the holders and storing it, and letting it go into the town from the holder, he would send it into the town direct, and let the holder simply act as a governor to receive the surplus gas. He was then cross-examined as to the auction clauses of provincial bills. The bearing upon the metropolitan gas companies would be this—the aggregate capital invested in London gas was about £11,000,000. The capital doubled itself in about eleven years. In that time £22,000,000 had been invested, and the £11,000,000 which were to be called up in eleven years would bear a dividend of 10 per cent. £1,100,000 more would be paid to the shareholders than was now being paid by the consumers. If the capital was competed for by the public, however, more than half a million of money would be saved to the consumers. The dividends they would avoid paying would amount to that sum. He thought the revision clauses did not work in the interest of the consumer at all.

On Friday, at the sitting of the committee, Mr. WEST said: Sir, will you allow me to make a very short explanation with regard to a matter in which I may have misapprehended what fell from the chairman. It appears that during a part of this discussion, a question has been raised as to the legal effect of the Act of 1868, with regard to the illuminating power of gas to be supplied to the gas consumers by the Chartered Company during hours at which the testing cannot take place. I will not now enter into any discussion about the meaning of those clauses, but it affects the question whether the Chartered Company had any moral right to deliver gas to their consumers of less illuminating power before five o'clock than afterwards, which, of course, they have not. The CHAIRMAN said: That is not precisely what I should have gathered from Serjeant Sargood's observation. When you come to your statement you will make it quite clear, I have no doubt. Now that the promoters have finished their case, I wish to say a word on behalf of my colleagues and myself. While we are determined to give every attention to the arguments on either side, we are naturally anxious to save the time of all concerned as much as we rightly can, and therefore, as we have formed an unanimous opinion adverse to one of the proposals of the promoters, and that an important proposal, we think that we may as well make this statement before we hear the opponents. The proposal to which I refer is that embodied in the 6th clause as it stands, to which the Government have stated, both to the House of Commons, through the Chancellor of the Exchequer, and to us by the letter of the Board of Trade, that they cannot agree. Notwithstanding these statements of the Government, we have thought it to be our duty fully to consider the arguments alleged in support of this clause; but neither these arguments nor the evidence have convinced us that it would, under present circumstances, be either fair to the producers, or advantageous to the consumers, to fix a price above which the dividend should be diminished, while below that price it could not be increased. We do not think that the objections to this proposal are removed by the clauses allowing an accumulation for a dividend deficiency-fund, which have been introduced into the bill since the second reading. At the same time we wish it to be clearly understood that we give no opinion upon the preamble of the bill, or upon any of its clauses except those which I have mentioned, and also that we give no opinion with regard to the suggestion in Mr. Farrer's letter, that the 6th clause should be replaced by a sliding scale, providing not only that dividends should fall as prices rise, but also that prices should fall if higher dividends can be earned. We understood Mr. Cripps to state in his opening speech that the promoters, while preferring their own proposal, would not oppose this suggestion, and one of their principal witnesses, Mr. Livesey, has strongly advocated it, and especially on the ground that it would stimulate the companies to sell gas at a lower price to the consumers. One reason, however, why I now make this communication is, that we think that it would be convenient if the promoters could inform us more precisely how far they are now willing to adopt this suggestion. Mr. Cripps, I doubt not, will give us information on this point after consulting his clients; but I hardly need say that we reserve our own opinion on the suggestion until we have had the advantage of not only hearing the opponents, but of hearing any witnesses whom we may ourselves think it right to call.

Mr. CRIPPS said: Probably, sir, under these circumstances, you will expect me to make a statement on Monday morning.

Yesterday, on the sitting of the committee, Mr. CRIPPS, alluding to the remarks of the chairman on Friday, said: The question put to me by the committee on Friday did not come fresh to my clients in any way. The matter is one that has come before them from time to time, more especially since the publication of Mr. Farrer's letter from the Board of Trade. We had the opinion of our witness, Mr. Livesey, on the matter, but we did not wish to control him in any way in giving his evidence. The conclusion we have come to has been put in writing, and it is as follows:—"The promoters of the Metropolis Gas Companies Bill, having regard to the expression of opinion of the committee to which the bill has been referred, and being strongly impressed with the necessity for the repeal of the revision sections, are willing to insert in the bill clauses regulating the supply of gas by a sliding scale of price and dividend, as suggested in the Board of Trade letter of May 31, 1875."

The CHAIRMAN: That being the case, I think the sooner you let me have the wording of the clause the better.

Sir E. BECKETT: This is very important, and I shall want to speak upon it presently; therefore it is but right that I should have the clause before me.

Mr. CRIPPS: I do not think much can depend upon the wording of the clause. There cannot be much obscurity in it, when the principle has been so clearly admitted.

Sir E. BECKETT stated that it would not take more than a few minutes to draft the clause.

The CHAIRMAN suggested that there should be a short adjournment for the purpose.

After some discussion, the committee adjourned for a quarter of an hour to allow of the drafting of the clause. On resuming, a clause was brought up, and handed to the committee by the promoters, to take the place of clause 6. By this substituted clause it is proposed to fix the standard price of common gas at 3s. 9d., and of cannel gas at 4s. 9d., the companies supplying at those prices to be entitled to 10 per cent. dividends, such dividends to be diminished or increased at the rate of one-quarter per cent. for every increase or decrease of 1d. in the price respectively.

Sir E. BECKETT then continued his opening address, after which Mr. *George St. George Burke*, Q.C., late governor of the Imperial Company, was examined at great length by Mr. VENABLES. His cross-examination was not concluded when the committee rose.

HOUSE OF LORDS.

MONDAY, JUNE 7, 1875.

The Bath Gas Bill was reported specially, with amendments.

The Broadstairs Water (Nos. 1 and 2), Busby Water, Hamilton Water, and Tunbridge Wells Gas Bills were read a second time, and committed.

The Ossett-cum-Gawthorpe Local Board, Rotherham Corporation, and Ashton-under-Lyne, Stalybridge, and Dukinfield District Water Bills were read the third time, with the amendments, and passed.

The following report from the Standing Order Committee was agreed to:—"That the Standing Orders not complied with in respect of the Widnes Local Board Bill ought to be dispensed with, and the bill allowed to proceed."

TUESDAY, JUNE 8.

The Worksop Water Bill was reported, without amendment.

The Rochdale Improvement Bill was reported, with amendments.

The South Staffordshire Water Bill was reported, on recommitment, with amendments.

The Longwood Gas and Marlborough Gas Bills were read a second time, and committed.

The Truro Water, Millom Gas and Water, Portishead District Water, Pontefract Borough Extension, and Bradford Water and Improvement Bills were read the third time, with the amendments, and passed.

The Blackburn Water Bill, brought from the Commons, was read the first time, and referred to the examiners.

A petition against the Broadstairs Water (No. 1) Bill was presented from R. Richardson and J. K. Wright, Standing Order No. 179, sec. 1, having been previously dispensed with.

THURSDAY, JUNE 10.

The CHAIRMAN of COMMITTEES informed the House that the opposition to the Kilmarnock Water Bill was withdrawn.

The LORD CHANCELLOR acquainted the House that the further Standing Orders, applicable to the Birmingham (Corporation) Gas and Birmingham and Staffordshire Gas Bills, have been complied with; and that no further Standing Orders are applicable to the Birmingham Gas (No. 2) Bill.

The Widnes Local Board Bill was read a second time, and committed.

The Bath Gas Bill was read the third time, with the amendments, and passed.

The Weardale and Shildon Water Bill, brought from the Commons, was read the first time, and referred to the examiners.

FRIDAY, JUNE 11.

The CHAIRMAN of COMMITTEES informed the House that the promoters do not intend to proceed further with the Southampton Corporation Gas (Purchase, &c.) Bill during the present session.

The Marlborough Gas Bill was reported, without amendment.

The Kilmarnock Water Bill was read a second time, and committed.

The South Staffordshire Water and Worksop Water Bills were read the third time, and passed.

The Chelsea Water, Gas and Water Orders Confirmation, Newport (Monmouthshire) Gas, Worthing Gas, and Oldham Corporation Water Bills were referred to a select committee, consisting of Earl Devon (chairman), Earl Nelson, Viscount Hutchinson, Lord Carysfort, and Lord Cloncurry; to meet on Wednesday, June 16.

BIRMINGHAM (CORPORATION) WATER BILL.—The Lord Hampton gave notice that on Monday, June 14, on the motion for second reading of this bill, he would call the attention of the House to the omission on the part of the Corporation of Birmingham to comply, in the case of the said Bill, with the requirements of the 63rd section of The Birmingham Improvement Act, 1851; and to move that the Bill be read a second time that day three months.

HOUSE OF COMMONS.

MONDAY, JUNE 7, 1875.

The Blackburn Water Bill was read the third time, and passed.

The Weardale and Shildon Water Bill, as amended, was considered. Clause added, amendments made; to be read the third time.

BURGHS AND POPULOUS PLACES (SCOTLAND) GAS SUPPLY (No. 2) BILL.—Petitions in favour of this bill were presented from Kilmarnock and St. Andrew's.

METROPOLIS GAS COMPANIES ACCOUNTS.—The accounts of the Metropolis Gas Companies for the year ended the 31st of December last were presented.

THURSDAY, JUNE 10.

The Weardale and Shildon Water Bill was read the third time, and passed.

The Inverness Water and Gas Bill (Lords) was reported, with amendments.

BURGHS AND POPULOUS PLACES (SCOTLAND) GAS SUPPLY (No. 2) BILL.—Petitions in favour of this bill were presented from Portobello, Helensburgh, Dundee, and Motherwell.

METROPOLIS WATER SUPPLY AND FIRE PREVENTION BILL.—The second reading of this bill was deferred till Thursday, June 17.

FRIDAY, JUNE 11.

The Lords amendments to the Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water, Ossett-cum-Gawthorpe Local Board, and Rotherham Corporation Bills were agreed to.

BURGHS AND POPULOUS PLACES (SCOTLAND) GAS SUPPLY (No. 2) BILL.—Petitions against this bill were presented from Ossett, Motherwell, Eltham, Nottingham, and Woolwich; and in favour, from Dunbar.

HOUSE OF COMMONS COMMITTEES.

WEDNESDAY, JUNE 2.

(*Before the Right Hon.* W. E. FORSTER, *Chairman*; *Mr.* S. B. BRISTOWE, *Mr.* J. G. TALBOT, *Mr.* T. BRASSEY, *and Mr.* H. BIRLEY.)

METROPOLIS GAS COMPANIES BILL.

(*Continued from page* 840.)

Mr. *William Newton*, recalled.

Cross-examined by Sir E. BECKETT: In arranging the districting between themselves, I presume the companies had reference to their existing supply at the time; but I think it was more with reference to places where their mains existed. The Act of 1860 was adopted by the Metropolitan Board upon compulsion. There was a clause in the bill compelling the board to pay the costs of it. I cannot say who were the promoters of the bill in the House of Lords. I should say certainly not the Metropolitan Board, but I should rather think the gas companies were, because it was so much in their favour after it left the Commons. It gave them the price of 4s. 6d., and enabled them to pay the dividends which they had not been enabled to pay for six years previously up to the rate of 10 per cent.

Sir E. BECKETT: Will you point out how it did that, or how they were restricted before that time from paying back dividends?

Witness: They were not restricted, but they did not pay them. The companies might have ceased to compete previous to 1860, but they had no power to prevent the introduction of new companies. There was a new company established in the east of London—the Great Central—in 1850, and I should like to explain the operation of that company. We had the Commercial Company existing there before the Great Central Company came to supply the City of London. In order to get Parliament to enact that the Great Central Company should be prohibited from supplying any portion outside the City, the Commercial Company entered into an arrangement with the authorities at the East of London not to charge a higher price than was charged by the Great Central Company. The Great Central Company in its Act was limited to a price, 4s.; it could not go higher for any purpose; the consequence was that the Commercial was bound to a price of 4s., but when the Act of 1860 was adopted, the competition was destroyed which was possible before that time, because any new company might have been started for the purpose. They were entitled to go up to 4s. 6d. They went as high as 4s. 5d., and they paid their back dividends for the six years previous to the passing of the Act of 1860, which amounted, I think, to 24 per cent., in addition to the 10 per cent. for the current time.

Sir E. BECKETT: Have you the least idea, having gone into this question for many years, that the Imperial, for instance, obtained any kind of advantage by the Act of 1860, except the removal of competition?

Witness: I should think that was the greatest advantage that could possibly occur, to give a company like the Imperial an absolute monopoly to supply a district within which no person could get gas by any other means, or establish any company for the purpose. The companies opposed the bill till the committee said they would sanction the districting.

Sir E. BECKETT: That was a valuable consideration to us, and we said so; and, in consideration for that valuable thing, did we not say we were willing to submit to regulations?

Witness: Yes. The only other advantage the companies gained was the one I have mentioned—the making up of back dividends.

Sir E. BECKETT: Do you not know perfectly well that before that time we had the power of making up back dividends for any time?

Witness: Yes; but you had the fear of competition before your eyes, which prevented you doing it. I have been a member of the board since 1862. The board did not take any part on the corporation bill of 1866, but in 1867 they appeared on the bill brought in by the Board of Trade.

Sir E. BECKETT: And then Mr. Cardwell said he would not act against the companies hostilely unless they had bills of their own, did he not?

Witness: He put his principle alternatively. He said there was only one way of dealing with the companies in regard to their dividends; that he had no desire to interfere with what Parliament had done by altering the law upon the case; but, unless the companies agreed to certain restrictions, he should feel disposed to pass the corporation bill. We have no bill for an independent supply now.

Sir E. BECKETT: What, then, is the difference between the present state of things and that of 1867?

Witness: That is for the committee to decide.

Sir E. BECKETT: It is for you to answer my question. You had a Works Bill, which you dropped; and a Purchase Bill, which you dropped; now you come with a Regulation Bill only, and you pretend to be following Lord Cardwell's report.

Witness: We do not profess to be following Lord Cardwell's report; on the contrary, we believe Lord Cardwell's report was made on the supposition that he could enact, in some way or other, efficient safeguards against extravagance and want of due care. We, finding that he has failed to do that, would have no hesitation, if Lord Cardwell was in the chair, to say, "You ought to pass our bill as a modification of the legislation of 1868." I believe Lord Cardwell would say now, by the light of experience of the action of these revising commissioners, that nothing could be effectual but a Regulation Bill. I think, in passing the City of London Gas Act in 1868, he did pass a Regulation Bill. That bill was brought in by Mr. Morrison, I think, under the title of the Metropolis Gas Bill, and it was turned into a City Gas Bill, upon the ground that the City were the only parties appearing before the committee with the bill.

Sir E. BECKETT: That would not account for it. The real reason was that the Chartered Company expressed, after a time, their acceptance of Mr. Cardwell's terms, and thereupon the other two companies, who were in the City selling against the Chartered, said they must come too—was not that so?

Witness: I believe the Chartered Company, finding that they must have new capital, were compelled to accept the terms submitted by Mr. Cardwell's committee, and the other companies felt they must do the same.

Sir E. BECKETT: The result was that the bill of 1868, brought in as a Metropolis Gas Bill, became a City Gas Bill, because the companies outside the City refused to accede to it, while the companies within the City consented to accept it.

Witness: Yes; except that the Chartered consented to the same restrictions applying to that part of their area outside the City.

Sir E. BECKETT: From the whole of the time you have had anything to do with this matter down to the present, do you know of a single instance of Parliament passing what you call a Regulation Bill against a company which had not a bill of its own before the House?

Witness: I do not know of any parallel case throughout the whole of England, but I do not know of any case where a company has the same distinctive privileges as are enjoyed by the metropolitan gas companies. I mean the principle of districting.

Sir E. BECKETT: How does the case of the Imperial Company differ from an ordinary monopoly of a gas company in any other town?

Witness: I take it no other company can be introduced in the districts of these companies.

Sir E. BECKETT: Could any other company be introduced in any provincial town?

Witness: I think it could be by a bill promoted in Parliament.

Sir E. BECKETT: So it could here. Do you not remember that the Act of 1860 expressly states that no new company shall be introduced except by the consent of Parliament?

Witness: I presume it would be so, whether it is stated or not.

Sir E. BECKETT: That being so, what is the difference between the district of the Imperial Company and any town you like—say Nottingham?

Witness: I think there is no doubt there is a solemn compact between Parliament and the companies that those districts having been assigned to them in the formal way they have, shall be guaranteed to them.

Sir E. BECKETT: Would you just answer my question in a straightforward way? What is the difference between the condition of the Imperial Company and that of the Nottingham Company, seeing that in neither case can a new company be introduced without the authority of Parliament?

Witness: Because there is in the Act of Parliament a certain district assigned to each company which no other company can supply. The same vested interest does not occur in a provincial town as does appear in this particular case. Parliament, in the case of any provincial town, has given no privileges that would prevent it, considering that it had the right to institute a new company; but in this case it would not be so. In 1869 we did not oppose the Imperial and South Metropolitan Bills, except on clauses. We wanted to see that they were properly put under the conditions of the City of London Act.

Sir E. BECKETT: You are only opposing the Imperial Bill now, I suppose, for clauses?

Witness: I cannot answer the question at the moment. In 1869 we consented to the preamble of the Imperial Company's Bill, because we knew the company must have more money in order to serve the metropolis. We wanted to get the company put under regulations like those of 1868, and we succeeded, except on the question of illuminating power.

Sir E. BECKETT: You succeeded except where you failed?

Witness: Yes; but there was a corresponding benefit, because whilst the Chartered Company obtained their 3s. 9d. and 16 candles, and had a 10 per cent. dividend, Parliament allowed you a 14-candle gas, only upon the condition that you would take your capital at 7 per cent. instead of 10. The Imperial Company had had bills in Parliament for several years, proposing only 7 per cent.; but, notwithstanding that, which was a great bonus to the public, amounting to about £39,000 a year, we contended for 16-candle gas.

Sir E. BECKETT: Did not the committee tell you they were satisfied that 14 candles would be sufficient for the people of London, according to Dr. Letheby's evidence?

Witness: I do not know; and, if so, that is not to bind us. That bill was recommitted, and two more members added to the committee, because the committee had not observed the conditions of the City of London Gas Act. The new committee adhered to the decision about the 14-candle gas, but they brought the bill generally under the provisions of the City of London Gas Act, 1868. The company were allowed a contingency-fund in addition to their reserve-fund of 5 per cent., which is the same as the Chartered Company.

Sir E. BECKETT: That arrangement having been made, we consenting to take 7 per cent., you now want to have the advantage of the 7 per cent., and to take away the advantages on the other side?

Witness: I do not think what we are proposing is to take any advantages away. I think what we propose will enable the companies to divide all the dividends which the Act enables them to do with the exercise of due care and management. If we can place the companies under conditions that will make them more at ease, and more in harmony with the consumers, and free from the contentions they are subject to from year to year, I think that will be advantageous for the companies.

Sir E. BECKETT: With a view to making things comfortable, suppose this Act of yours had been in existence, should we have been able to get any rise of price under the late rise in the price of coal?

Witness: I think probably you might; you would have charged an extra price, which would have reduced your dividends. I do not think the rise of your price would have been very great, because, if you look at the surrounding companies, not one of them went up to the price you did by a very long way, and they were able to pay their 10 per cent.

Sir E. BECKETT: With regard to extravagance, are you aware that the commissioners and referees have the power of inquiry into everything we do, that they have the power of seeing our books and works, and everything about them?

Witness: That is after they have been formed. I dare say it is so.

Sir E. BECKETT read the clauses of the Imperial Act, under which the commissioners were appointed, and a list of the questions addressed by those gentlemen to the company, the answers to which extended over 15 or 16 pages.

Cross-examination continued: We have no means of efficiently inquiring into the question as to whether capital has been expended wastefully or otherwise. I do not, however, think I could give you a stronger case than that mentioned by Mr. Cripps yesterday—the conversion by the Imperial Company of their loan capital into share capital. That proceeding was not expressly authorized by law, but there was a general power which was obtained by the company, I think in 1854, by incorporating a very general Act. For many years previous to the year 1866 the Imperial Company had a loan of £260,000, at rates varying from 4 and 5 per cent., not exceeding 5 per cent.; but finding themselves possessed of this power, which they had obtained by incorporating a general Act with their own Act in 1854, in the year 1866 they converted that loan capital into share capital, to pay 10 per cent. interest; by that means they

saddled the consumers of the metropolis with a permanent annual payment of £13,000; and then, under their revision clauses, we find they are enabled to charge whatever price is necessary to pay that dividend at 10 per cent. If for years that loan had existed at the rate of 5 per cent., upon which they only paid £13,000 a year interest, they might have continued it without putting £13,000 a year into the pockets of the shareholders, and saddling the consumers of the metropolis with that as a permanent payment in the future.

Sir E. BECKETT: Did not everybody know perfectly well that not only the Imperial Company, but every other company, by virtue of that very general Act, had the power to do this thing?

Witness: That only makes matters worse. Somebody ought to have been in existence to have watched the incorporation of that Act, and to have prevented it. We did not complain of it in 1869, because it was all over then. I mention this as an evidence of what the directors of a company may be expected to do if they can go to the Revision Commissioners and obtain any sum that is necessary (that is, within the 5s. 6d.) to secure 10 per cent. With regard to expenditure of capital, we have been entirely stopped from any inquiry into that. Generally, there is no control over the management of the companies so long as their interests are not those of the consumers. I suppose the South Metropolitan and the Imperial Companies have reduced their price because of their capabilities to supply their consumers at a less price. I cannot tell you who is the author of this scheme of sliding scale; I believe there is an Act of Parliament with regard to the West Ham Company in which it already exists. I have here a clause which was proposed in a bill for the metropolis by Sir Stafford Northcote in 1867, when he was President of the Board of Trade, to the effect that when the price charged was the maximum price according to the prescribed scale, the rate of dividend was not to exceed 7 per cent. per annum, and when the price charged was less by 1d. per 1000 feet than the maximum price chargeable according to the scale, and so in respect of each further reduction of price by 1d. per 1000 cubic feet, an additional dividend of ½ per cent. per annum might be paid.

Sir E. BECKETT: Will you show me how these clauses of yours—the 6th, 48A and 48B—are to give us any sort of recoupment or back dividends, or any kind of compensation?

Witness: You are not entitled to any back dividends under your present Act.

Sir E. BECKETT: If we have a loss one year, that loss can never be recouped?

Witness: Not now, unless you take it as the Chartered Company did in 1873, out of what was allowed for the contingency-fund, which they never appropriated. It could only be done then in the event of the contingency-fund not being made up to its full amount. I do not know whether that is legal or not.

Sir E. BECKETT: Do you mean that if the commissioners make a mistake the companies ought to suffer for it?

Witness: I do not admit any mistakes by the commissioners, because their calculations are based upon information supplied by the companies. The whole thing is bad, and we had better make your interest ours, and fix your price, so that you can make your 10 per cent. dividend, and induce you to exercise due care and management in your works, and if you do not we must bear a portion of the loss, and you must bear the remainder. I have always understood the companies to say that if they could get their 10 per cent. they would be perfectly satisfied, but they say, "We cannot, at the price of 3s. 9d., and with an illuminating power of 16 candles, ensure ourselves against exceptionally high prices." Then we say, "There are periods of low prices when you can manufacture gas of that quality at a less price. We enable you by this Act to put aside a sum equivalent to 5 per cent. upon your whole capital in order to tide you over periods of high prices. If you had had a reserve-fund in 1873 like that which we now propose, you would have been able to pay your dividend without any increase in price."

Sir E. BECKETT: If the reserve-fund is exhausted, and there comes a bad year, how are we to get our dividends made up?

Witness: You are supposing a state of things not likely to occur.

THURSDAY, JUNE 3.

Mr. *Newton* recalled, and further cross-examined by Mr. VENABLES.

Our original scheme was to allow no reserve-fund at all, but after a conference with the President of the Board of Trade, who represented to us that the Government thought that clause 6 as it stood was an unfair clause, and required some modification, we suggested that it should be modified in the way indicated in the new clause.

Mr. VENABLES: The objection, as I understand it, that Sir Stafford Northcote made on behalf of the Government was that it was disturbing the bargain that had been made with the companies.

Witness: I did not see Sir Stafford Northcote myself, and I did not hear that he had made such an observation; nor do I think it possible that he could have done so, seeing he had himself proposed a bill with a similar disturbance.

Mr. VENABLES: In the letter from the Board of Trade there are these words: "The bill of the Board of Works proposes to fix the price at 3s. 9d. for 16-candle gas for all companies, with no power to raise it except on condition of reducing the dividend; such a provision appears to Her Majesty's Government to be a breach of the existing arrangements with the companies, to which, as stated by the Chancellor of the Exchequer, on the second reading of the bill, they could not agree;" that seems to be pretty much to the same effect, that it was disturbing a bargain?

Witness: You will find that the Board of Trade proposes a substitute. Our bill might in its original form, in the opinion of the Board of Trade, have been a breach of the existing arrangement, but if we inserted the additional clause which we propose, enabling them to raise a reserve-fund, that might remove the difficulty. You cannot go further than this, as regards existing arrangements, that you were to divide a 10 per cent. dividend if you earned it by due care and management. Certain conditions were imposed, in the hope of ensuring due care and management, and we have had evidence, after those conditions have been applied, that they are futile, and we now come back to institute some arrangements by which due care and management shall be ensured; and until we get that assurance, we have not got what the previous legislation intended to give us. We were no parties to the Act of 1860. I may go further, and say that the promoters of the bill themselves would have withdrawn it at a certain stage, but that they had incurred such great liabilities that they were induced to accept the bill in order to charge their liabilities upon the ratepayers. The Metropolitan Board appeared in the interests of the consumers, and so far as the bill promoted the interests of the shareholders as against the interests of the consumers they were opposed to the bill.

Mr. VENABLES: Is it not the case that the present bill is introduced without the consent of the companies, and that Lord Cardwell's committee held, both in 1867 and 1868, that there was an objection on principle to such a bill without the concurrence of the companies?

Witness: That is so. Not that there would be an objection to the introduction of a general bill, but that it should only be made to apply to companies as they came before Parliament for increased powers.

Mr. VENABLES: Do you know what amount of capital the Chartered, the Imperial, and the South Metropolitan Companies, under the legislation of 1868 and 1869 (the Chartered Company including the companies it has amalgamated with) have issued?

Witness: I think the Chartered Company must have issued shares to the extent of about £1,500,000; £500,000 of shares were issued only a few weeks ago, and only £2 a share has been paid up of that. Everybody who bought those shares in the market bought them, taking into consideration not only what has actually been paid up, but what will be paid up on the remainder of the calls. I do not know what the Imperial Company and the South Metropolitan Company have raised since 1868. The Imperial Company are in Parliament this year for the purpose of raising new capital, which seems to imply that it has exhausted its powers. At the end of 1873 the share capital of the whole of the companies amounted to £8,759,516. I do not know what proportion of that has been raised since the Act of 1860. I should say more than half of it.

Mr. VENABLES: And if more than a half of it—say £5,000,000 (we will show what it exactly is)—the whole of that has been raised either on the faith of the Act of 1860 or, as regards the companies affected by subsequent Acts, on the faith of the arrangements of those subsequent Acts?

Witness: Of course. The direct effect of clause 6 would be, in certain cases, to alter, unfavourably to the holders, the terms on which they have invested their capital, if it is held that the revision clauses of the Acts of 1868 and 1869 guarantee to the companies a dividend, under all circumstances, of 10 per cent.

Mr. VENABLES: The revision clauses apply to the three companies, but the remaining companies under the Act of 1860 have no revision clauses.

Witness: Those three companies have raised more than two-thirds of the whole of the capital of the gas undertakings in the metropolis. If they can earn their 10 per cent. dividend by the exercise of due care and management, they are entitled to it; but due care and management, I presume, means the application of all the skill and economy that can be brought to bear upon the manufacture of gas, which I am prepared to say that there are not, under the present Act, any efficient means of testing, and that is what is required.

Mr. VENABLES: Are you prepared to say that any of them have not used due care and management? I do not mean as to their capital, but as to the conduct of their business.

Witness: I cannot say. I have no doubt witnesses will be called who are experts in the manufacture of gas, who will be able to answer that question better than I can; but I say that the tendency of recent legislation and of the present Act of Parliament is not to induce those engaged in the manufacture of gas to exercise due care and management in its manufacture. The Metropolitan Board are of opinion, from information they have received, that gas of the quality now consumed in London might be sold at a less price than it is, and the companies pay the prescribed dividend on all the capital invested, including a contingency-fund and a reserve-fund, to those which have it. I am aware that wages have gone up very much, but I think the present contracts for coal would compare with those of 1869. My impression is that the contract now existing for the largest company in London is less than it was in 1869.

Mr. VENABLES: Do you think it would have been possible during the dearth of coal, when the contracts were made at the prices which prevailed two years ago, for the companies to earn their present dividend at the price of 3s. 9d.?

Witness: I think some of them did. The Ratcliff Company never charged more than 3s. 9d. during the whole period; and the South Metropolitan never charged its maximum price during that time. They did draw on their reserve-fund a little, but if you add what they drew from their reserve to the profits, considerably less than their maximum price would have made up the whole. If this bill had been in operation in 1872, I have no doubt the Chartered Company would have been in a very much better position than they were, because it would have been enabled to pay its dividends with a less charge to its consumers than it made. There would have been more diligence and economy exercised, and all the inducements to keep up the dividend at the maximum price would have been in operation. I do not know what the price of coal was in other places during the coal famine. I believe the Imperial Company were obliged to draw on their reserve-fund in 1873 to pay their dividend; but I do not know exactly.

Mr. VENABLES: At the beginning of 1874 the Imperial obtained their proposed increase of price; do you know what their dividend would have been reduced to—the reserve-fund being in a great measure exhausted—if they had not had that rise in price?

Witness: If they had been compelled to charge 4s. 8d.—which I do not admit—their dividend would have been reduced to the extent of 2¾ per cent.; but I have no doubt they could have exercised greater care and economy.

Mr. VENABLES: That applies to any business in the world; as it becomes less profitable you can make up the loss by exercising greater care and economy?

Witness: I think it does, except where, like the companies in London, you are guaranteed such price as will enable you to make such a dividend as 10 per cent., and then all incentive to the exercise of those qualities is lost. The shareholders and directors of gas companies have as much of human nature in them as most people, and they will do what is most profitable and beneficial for themselves.

Mr. VENABLES: Surely you must contemplate, as a possible thing, another great rise in the price of coal in consequence of the condition of trade?

Witness: It is not impossible, but I do not think that the price of coal absolutely regulates the price of gas. The products from coal—I mean coke—rises in price to a great extent commensurately with the rise in the price of coal. I know that during the exceptionally high period of coal, coke did not at all times fetch the proportionate price that might reasonably have been expected, for the price of coke does not go up quite commensurately with that of coal; there is a certain loss. I do not know the exact proportions; but I know that out of the residuals a very large amount is realized, and I say the companies ought to be able to manufacture gas at a cheaper rate now in consequence of the very high price which some of the residuals are fetching. We all remember the time when two of the most important residuals after coke—that is tar and ammoniacal liquor—were useless waste, and of no value whatever; rather a nuisance than otherwise. I was looking through the report of the Chartered Company during the past year, and I find that from what some years ago was a positive nuisance, and waste and valueless, they realized £85,000 in one year—that is to say, tar and ammoniacal liquor. The one has come into use for the manufacture of artificial manure, the other for those beautiful dyes that have been discovered within the last few years. That £85,000 is equal to 5 per cent. upon the ordinary share capital of the company, and is equal to 2½ per cent. upon the whole capital of the company, including loans.

Mr. VENABLES: That shows that the disposal of the tar and ammonical liquor was not a proof of want of due care and management?

Witness: No; but I contend it was a thing wholly outside the manufacture of gas. The value of those products has gone on irrespective of any skill and management on the part of the companies; but of course they have profited by those things when there is a demand for them.

Mr. VENABLES: Is it not the case that the rise in the price of coal, whatever may be the value of the residuals, necessarily adds to the cost of the manufacture of gas?

Witness: Unless the price of the residuals goes up in proportion. If the margin between the price of coal and the price of coke be always the same, whatever the price of coal, there is no increase in the price of manufacture.

Mr. VENABLES: Suppose coal at £1 a ton produces residuals worth 10s. a ton, and suppose coal at another time is £4 a ton, and produces residuals worth £2 a ton, that would be the same proportion, would it not?

Witness: I did not say the same proportion; I said if in all cases the difference between the cost of coal and the value of the residuals was the same. If during the late coal famine instead of paying 16s. a ton, companies were

paying 26s. a ton, and if the price of coke went up so that it only left a difference between the price of coal and the price of coke of 10s. in each case, the manufacturer of gas would not be interfered with by the price of coal.

Mr. VENABLES: Do you represent that as a practical thing? Do you say that there is any sort of reason why, when the price of coal greatly increases, the price of residuals should increase in a much larger proportion?

Witness: Yes, I think there is. Supposing in the ordinary time the difference between the production of coke and the consumption of coal cost 10s. to the company—that is to say, when coal is at its ordinary price—then if it goes up from 16s. to 26s., and if the residuals realize 16s., and leave only a difference of 10s., in that case the manufacture of gas would not be interfered with, and I am not sure that that is not precisely the state of things as they exist. In the inquiry before the commissioners, I believe the probable price of the residuals was taken into account, as well as the price of coal; but there the commissioners had only to take evidence as to what was necessary to make up a dividend of 10 per cent., and they arrived at it as an arithmetical sum. We pressed upon the commissioners the desirability of not giving them what they required, for the reason that they had entered into improvident contracts; they had at the time of exceptionally high prices made contracts extending over a long period of time, and we sought to get those invalidated to a certain extent, even at the risk of the companies not being able to obtain 10 per cent dividend. The commissioners acknowledged that the contracts had been improvident, but all they had to do was to prescribe the price that would enable them to divide 10 per cent. Our bill, as now before the committee, enables the companies in times of prosperity to raise a reserve-fund, which would enable them to pay their dividend in times of high prices and depression. Supposing those times of high prices and depression had lasted two years longer, the Imperial Company would not have been able to divide 10 per cent. dividend; but I do not know what the exact amount might have been. We purposely framed our bill with a view of throwing upon the companies a proportion of the loss sustained in those years.

Mr. VENABLES: Will you say in what respect it is inaccurate to describe your clause as a breach of the existing arrangements under which the companies are, if they can earn it with due care and management, entitled to the prescribed dividend?

Witness: Because at the present time we have no means of ensuring due care and management. If there are periods of great depression, the loss ought to be equitably born between the consumers and manufacturers. I do not know whether that is the principle on which Parliament has in any single case legislated. I do not think that, except in London, there are any Acts which give a guarantee that the companies shall receive a dividend of 10 per cent. What I say, and what the board thinks, is this: if you are to look upon this dividend as a guaranteed dividend of 10 per cent., and the companies are to have it under all circumstances of high prices and otherwise, the shareholders and directors are not the proper persons to be entrusted with the manufacture of gas. You might as well say that the fund-holders of this nation should manage the imperial affairs, and not the taxpayers. My desire is to act equitably between the two—to make the two interests identical.

Mr. VENABLES: Did Sir Charles Adderley represent to you what is mentioned in the letter of the Board of Trade, that there ought to be a sliding scale up and down?

Witness: No; it was stated, I think, by Sir James Hogg, that there were only two ways in which the sixth clause could be modified. The one was to make the scale go up as well as down; the other was to make a reserve-fund, which would enable the companies in times of low prices to contribute to the dividends in times of high prices. The board considered that question, and the latter proposition was the one they decided on.

Mr. VENABLES: And the other proposal, which we think quite as objectionable, or nearly so, as the clause in your bill, as it stands at present, seems to be adopted by the Board of Trade, even after your interview?

Witness: It does, according to that letter. Of course we had no previous knowledge of that communication.

Mr. VENABLES: I see by clause 26A there is an alteration you have proposed. As the bill originally stood, it was proposed that the minimum of testings of each day should be taken to represent the illuminating power, and now it is altered to the average; why is that done?

Witness: After the bill was in print we discovered that it varied the present Act of Parliament—that is to say, the legislation of 1868 and 1869. Three testings are prescribed there by the referees, and the average of the three is to be taken as the illuminating power of the day.

Mr. VENABLES: And you knew that when you put in the lowest, or whoever drew the bill must have known it?

Witness: I do not know that. It did not quite represent our views, and we modified it in that respect. Our provision in clause 48A is, in substance, that the companies may apply any surplus over the dividend to make a deficiency-fund. They have power, to the amount of 5 per cent. on the whole capital, to make a reserve-fund, if they can, in good years. According to clause 48B, they may take any money from the reserve-fund to make up any deficiency in their dividends they are entitled to.

Mr. VENABLES: Supposing by reason of a rise in price the dividend is reduced, say, to 8 per cent. instead of 10 per cent., the companies cannot take anything from the reserve-fund during that year?

Witness: Except to make up the 8 per cent.

Mr. VENABLES: Consequently, when section 6 was in operation, clauses 48A and 48B would not apply.

Witness: They would apply in this way, that, having adopted section 6 and having fixed your price so as to entitle you in that particular year to 8 per cent., you could only use your reserve-fund to make up that 8 per cent. The Government adopt our clause, and make an addition that the scale shall ascend as well as descend.

Mr. VENABLES: They do not say anywhere that that should be imposed compulsorily upon the company?

Witness: That is for the committee to decide, but you cannot consider our 6th clause in connexion with a reserve-fund. We do not propose a reserve-fund and the 6th clause too. If the committee decide upon adopting the Government suggestion that there shall be a sliding scale of dividend—that is, that it shall go up as well as down—then we should withdraw those clauses as being unnecessary.

Mr. VENABLES: Suppose the operation of clause 6 was to reduce the 10 per cent. dividend in any year to 8 per cent., then the reserve-fund could not be applied so as to make up the deficiency to more than 8 per cent.?

Witness: That is evident. Clause 6 states that the dividend to be divided must be proportionate to the price charged to the consumers. If you charge a higher price to the consumer, your dividend is fixed at so much less than 10 per cent., and your reserve-fund may be used to make up that exact amount, because if you have been prevented from charging the consumers what was necessarily a higher price to make up your dividend of 8 per cent., they had the benefit of that for the year, and, therefore, it is only fair to say that you should use your reserve-fund for the purpose of making up your dividend.

Mr. VENABLES: If Sir Stafford Northcote was right in saying that section 6 would be a breach of faith, because it would in certain cases reduce the dividend below the prescribed dividend, your clauses 48A and 48B would leave that as it was?

Witness: I do not understand the Board of Trade's letter to say that it would be a breach of agreement, because it would reduce the dividend below 10 per cent. You are only entitled to a prescribed dividend when you have conducted your affairs with due care and management, and we say that we have no means of testing that, and, under the present circumstances, you have no interest in due care and management. The Metropolitan Board have no policy with regard to buying up the companies, except that which was explained in their own bill. If these regulations are passed, and are satisfactory, I should think it would be a long time before you will hear anything about a purchase or competing scheme, but you cannot have any security against any deliberative body taking up any question. It is impossible for the companies to be under more favourable circumstances than they are now. If the result of the operations of the Revision Commissioners is to ensure them 10 per cent. under any circumstances, nothing can give them a higher position than that.

Mr. VENABLES: You mean to say they ought to be in a worse position?

Witness: I mean to say it is an improper position for them to be placed in. If they obtain an advantage from an improper state of things, it would be taking some advantage from them to place them under proper regulations.

Mr. VENABLES: Supposing they were to be bought at so many years purchase of their revenue, the purchase-money would be proportionately less?

Witness: Of course it would, if the principle of our bill were adopted—that of buying them at their market value. If the shares went down in consequence of that bill, then, of course, they would have to sell at a lower rate. I believe if this bill passed you would introduce new life into the whole system. You would have your shareholders looking up your directors, and your directors looking up your engineers; every halfpenny of expenditure would be narrowly watched, and you would be able to maintain the position you now occupy.

Mr. VENABLES: You think, in short, though you take from us certain rights which we have at present, that the value of our property would not be deteriorated?

Witness: Eventually it would not, because it would stir up a different feeling in the manufacture of gas.

Cross-examined by Serjeant SARGOOD: If I understand the effect of the report of Lord Cardwell's committee, it is this, that if there had been a competing bill by which the Corporation of London and the Metropolitan Board had proposed, either to supply the whole of London with gas, or to buy up the existing companies, Lord Cardwell would have been prepared to say, "Unless you, the companies, who appear in opposition, are willing to accept those terms as regulations affecting the whole of your companies, we will pass this bill of the Corporation and the Metropolitan Board."

Serjeant SARGOOD: What Lord Cardwell said, and said more than once in various places, was this: "I will not coerce the gas companies into any new arrangements, but if I had a bill here by a stranger for a competitive supply, I should then know how to deal with it;" and there was no such bill?

Witness: I think Lord Cardwell said something more than that; he said in effect that the Act of 1860 was unsatisfactory, and that he found a difficulty in dealing with the companies in the absence of a competing bill, or a special bill of the companies own. He had two such bills in 1867, but he was frustrated by their refusing to accept the terms. The bill of 1868 was originated by Mr. Beal; but I was never associated with that gentleman upon the gas question in any way. Lord Cardwell made a tender to the Chartered Company that they might take their bill for their fresh capital, and whatever they wanted, subject to his regulations, stating that if they did not like them they might perhaps prefer that he should give the bill to the City of London, so as to enable them to set up a competing establishment. The Chartered Company accepted the restrictions, and subsequently announced that they had conferred with the other two companies who served the City, who expressed their willingness to come under the same regulations. The Metropolitan Board were averse to the capital being raised at 10 per cent.; but I think they were satisfied with the other provisions of the bill, as to testings for impurity and illuminating power. When the bill went to the House of Lords, both the Metropolitan Board and the Corporation were so anxious to preserve it in its then form, that though some people petitioned against it, they lodged petitions against any alteration. The revision clauses were a great novelty, and were supposed to be a great protection to the public and the companies. Now, after experience, the companies insist upon the retention of the terms, and we are dissatisfied with them.

Serjeant SARGOOD: When that bill was in the House of Lords in 1868, did you think that you had hit upon a scheme for producing perfect harmony, and making the two interests identical; did you think you had accomplished that then?

Witness: I do not know what I thought then. I think now that an improper advantage has been taken of the revision clauses.

Serjeant SARGOOD: The Chartered Company having had this forced upon them, have you anything to say as to their want of loyalty in endeavouring honestly to carry out Mr. Cardwell's legislation, except the point that you think they have taken an undue advantage of the revision clauses?

Witness: That would direct our attention to the whole question of their mode of raising and expending capital, and the management of their works; and I am sorry to say it was discovered, during the revision in the case of the Imperial Company in 1874, that we had no power to make that inquiry.

Serjeant SARGOOD: Is there any company at this moment at all affected by that amended legislation of 1868, except the Chartered Company who accepted it in its integrity, and the Imperial and South Metropolitan Companies, who have adopted a portion of it?

Witness: Not unless the London is included, which is a legal point.

Serjeant SARGOOD: Is the experience of the public and the Metropolitan Board, as to the effect of the Act of 1868 in its integrity, limited to the conduct of the Chartered Company?

Witness: No. I also judge of its effect from the Imperial Company, who obtained a rise of price.

Serjeant SARGOOD: You judge of it from them; so far as they have adopted the Act of 1868, have they been loyal to it or disloyal?

Witness: When you use the term loyal or disloyal, I can only answer you in this way. I cannot put my hand upon anything which they have done illegally, and if they are legally acting under the Act, I presume they are loyal to the Act; but what I complain of is, that the Act itself ought to be amended, because it has been proved to work injuriously to the consumer. It is clear the companies themselves never expected to derive the great advantage from those revision clauses which they have done, or they never would have objected to accept the Act of 1867, which bound them to the 3s. 9d. price; they might have accepted any price, 9d., or anything else, with the revision clauses.

Serjeant SARGOOD: The thing was not in print in 1867; it was only the principles that were discussed then?

Witness: But in 1867 the Chartered Company had a bill before the House, and when Mr. Cardwell presented the report of his committee to them and said, "Will you accept your bill upon those terms?" they declined it.

Serjeant SARGOOD: Will you refer me to anything in the report of 1867 touching the revision clauses at all. We resisted certain things, and the revision clauses came as a sop in 1868 to try and induce us to give way.

Mr. PHILBRICK: They are, in 1867, in almost the same words.

Serjeant SARGOOD: I say in principle they were suggested, but there were no details as to how they would operate.

Mr. PHILBRICK: Will you read the last paragraph of the second resolution adopted by the committee?

Witness: The words are, "In this case they will insert also in the bill machinery for the periodical revision of the price, in conformity with this principle."

Serjeant SARGOOD: There was not a model of the machinery, still less a made machine?

Witness: I do not think you would say you would not understand what that meant when it was proposed. Amalgamation was a new principle introduced into a public bill. I know that under a scheme afterwards sanctioned by an Order in Council in 1870, the Chartered Company amalgamated with the City of London and the Great Central Companies, and by a bill in the same year with the Victoria Docks Gas Company; also by a bill in the next year with the Equitable Company, and by a scheme in the following year, sanctioned by an Order in Council, with the Western Gas Company.

Serjeant SARGOOD: Do not you know that we did that in a loyal attempt to carry out Mr. Cardwell's legislation of 1868 under the terms and conditions of the Act of 1868?

Witness: Certainly, and we helped you to do it, because we thought amalgamation so good.

Serjeant SARGOOD: Do you think it fair, now that we have spent a million of money, and pledged ourselves to carry out the provisions of the Act of 1868, to come and rescind that Act which you once thought good, and which you have now altered your minds about?

Witness: Yes, I think it quite fair to subject the companies to a new system of regulation.

Serjeant SARGOOD: Will you tell me how you are to do us equal justice, putting us on equal terms with the other companies—rescinding our amalgamation, and returning to us our capital? How do you propose to do that?

Witness: I do not suppose that it is at all necessary. You would not ask us to rescind the amalgamations, because they have been of so much benefit to the Chartered Company, while they have been a great injury to the consumers that were supplied by the companies you have amalgamated with.

Serjeant SARGOOD: You mean that the whole machinery of 1868, though you do not like to admit it, was a blunder?

Witness: I am bound to admit that we were all deceived.

Serjeant SARGOOD: You know that under that very Act of 1868 which we took, accepting your legislation, we had to raise £650,000 of new capital? And you are aware also that in 1872, I will not say with a guarantee of 10 per cent. dividend, but with a power of getting 10 per cent. if we could, we came for a further amount of capital to the extent of exactly £1,000,000, in order to carry out those great works on the footing of the 1868 Act? Do you know also that you and your friends, having caught us in a trap, and found that we were setting to work to carry out the 1868 Act, came to try and cut down our dividend on the £1,000,000?

Witness: That is very likely.

Serjeant SARGOOD: I will not ask you whether you thought that kind. I will ask you whether you thought it honest, when we had amalgamated with those companies, and were compelled to raise a million of money to carry out your objects of 1868, to come and try to cut down our dividend?

Witness: Certainly; I understand that you are now speaking about the new capital which you desired, and which Parliament sanctioned you to raise. Clearly it was within the purview of Parliament to prescribe the rate at which you should raise your new capital, and it was within the power of Parliament to say that you should only raise it at 7 per cent., having raised so much at 10 per cent.; and there was no impropriety or dishonesty in the board, acting in the interest of the consumers, coming here to ask the committee to do that. If the £1,000,000 was necessary to enable the company to carry out the Act of 1868, why did they not apply for the capital at the time they obtained the Act of 1868? We do not propose in our bill any inquiry into capital at all, because we have expunged the revision clauses; and I may repeat what I said before, that personally I do not think it necessary, if the committee pass our bill, to inquire into the due care and management exercised by the companies in the making of gas. I am perfectly satisfied that, if the dividend depends upon the price, they will exercise all due care and management, and apply all the skill and economy necessary in the interests of the consumers.

Serjeant SARGOOD: Do you not know that no company has the power to raise any capital at all except by parliamentary sanction, and, before that sanction is obtained, the company must make out a case before a committee to prove that it requires that capital before they grant it?

Witness: To a certain extent that is so, but everybody knows that the proof of the requirements of capital before a parliamentary committee is not so close an inquiry. Generally a margin is given to a company, not only for what they require upon the estimate for immediate expenditure, but to tide them over some years, in order that they may not be coming year after year with new bills. If you get power to raise a million in 1872, that may not be expended for five years; it is not in the power of a committee to judge of the immediate necessity for the raising of that capital, but still they allow it. I think, therefore, after it is authorized generally by the Legislature, that you should, before issuing stock for the purpose of raising any portion of that million, justify to some public body, who can act in the interests of the consumers, the necessity of raising the capital to the extent to which you propose to raise it.

Serjeant SARGOOD: And so try the question over again. Having satisfied the committee *primâ facie* that you want it, you are to satisfy an inferior body that you actually want it?

Witness: You satisfy the committee that it may be wanted in the course of time. I want another body to exercise a judgment as to whether the precise time has come when that capital may be employed.

Serjeant SARGOOD: Then what is the use of a body of directors, who are supposed to judge whether they want more capital or not, in the interests of the shareholders?

Witness: I should have perfect confidence in leaving it to the directors, if they were not personally interested in the issue of a large amount of capital, because it brings them a greater profit. So long as the companies are guaranteed a dividend of 10 per cent., I do not think the directors or shareholders should have anything to do with the issuing of capital or the manufacture of gas. The directors should be persons appointed by the consumers, and not by the shareholders. If the dividend be first guaranteed, and you can go to the consumers for whatever may be necessary to make it up, your position is that of holders of Consols, and the taxpayers must pay what is necessary to produce the dividend.

Serjeant SARGOOD: Has it ever occurred to the Metropolitan Board to carry on the business for nothing, and to guarantee the shareholders a given sum?

Witness: Yes. We proposed to purchase the gas companies at their market value, and we were prepared to give a consideration more than that for compulsory purchase. We were met by a bill of your own company, in which they professed not to be averse to purchase on the part of some public body; but they said we ought to give them Government securities that would produce the same dividend to them, which meant that their shares, which were ranging at 170 in the market at that time, should have been exchanged for Consols that would have cost nearly 290. When they came, in 1872, to raise £1,000,000 of capital at 10 per cent., they assigned, as a reason why they should have 10 per cent., that they were engaged in a risky undertaking, and that they were, therefore, entitled to 10 per cent.; but, when they proposed that the public body should buy them, they insisted that they were not a risky undertaking at all, that they were as safe as Consols, and that they ought to have their stock exchanged for Consols, on the basis of the dividend that they were receiving at the time. I do not think that there was any price in our bill, nor do I think there was any necessity for any. The way in which we put it was this—that we should be entitled to charge the lowest price for which gas could be manufactured, consistently with paying the interest upon the money borrowed for the purchase. Our clause was so framed that there could be no surplus.

Serjeant SARGOOD: Supposing you had fixed a price that did produce a surplus, what would you have done with that surplus?

Witness: I had better read the clause in the Works Bill with respect to the application of moneys received by the board for the supply of gas: "First, in payment of the gas establishment charges—that is to say, of the expenses properly chargeable to revenue of establishing, conducting, managing, and maintaining gas-works, or supplying gas. Secondly, in payment of the interest on the moneys borrowed or applied by the corporation for the purposes of this Act, and the balance (if any), or so much thereof as may from time to time be necessary for such purpose, shall be applied towards the formation of a reserve-fund, to be called the 'City Gas Reserve-Fund,' until the same shall amount to a sum equal to £4 per centum per annum on the total amount of moneys borrowed or applied by the corporation for the purposes of this Act, and when in any year such balance, or any part thereof, shall be required for raising the 'City Gas Reserve-Fund' up to or maintaining the same at such amount, such balance or such part thereof shall be applied in reduction of the principal moneys borrowed or applied for the purposes of this Act."

Serjeant SARGOOD: Do you know whether before your Purchase and Works Bills were printed—when the draft bills were brought up for the approval of the Metropolitan Board—the price was named?

Witness: The maximum price was named in our earlier consideration of the question. I think it was 4s. 6d.; but it was struck out because, as the consumers were to manufacture gas for themselves, it was not necessary that they should prescribe any price.

Serjeant SARGOOD: The committee who brought up the bill were rather twitted by some of the members, when they brought up their report, for omitting the price, and Mr. Richardson said there was ample reason why they should not put a price in the bill; on the one hand, it was quite clear they might make it cheaper, but it was quite possible also that contingencies might arise that would make it necessary for the board to charge more than 4s. 6d. They might have coals go to an enormous price beyond anything they could conceive.

Witness: At the present time, the consumer has to pay the whole of the costs of any increase in the price of the raw material, or whatever is necessary for the production of gas. If the consumers produce it, they must pay; but they are not called upon to pay 10 per cent. dividend, in addition to the cost, to persons who are not interested as consumers.

Serjeant SARGOOD: Take any trade—must not the cost of the material and the cost of manufacture be paid before there is any profit at all?

Witness: Yes; but in the case of purchase, that would not have fallen upon us so heavily in our hands as it does in the hands of a company, and we can borrow money cheaper than a company can.

Serjeant SARGOOD: When the prices of materials are high, does it not cost the manufacturer more money to make the article than when they are low? And does not that mean that he must provide a larger amount of capital than when things are cheap?

Witness: A larger amount of working capital; that may be so.

Serjeant SARGOOD: If so, when the manufacturer is pledged to supply you with gas, whether he likes it or not, will you tell me why, if things are so adverse that he is obliged to increase his capital to meet the exigencies of the times, you are to punish him, and tell him, "Because you are obliged to put your hand deeper into your pocket, therefore you shall earn less money?"

Witness: Your premises are not correct. The companies have not increased their capital because of the high prices. The high prices could affect no portion of their capital but that which was engaged as working capital—a few thousands of pounds; it did not necessarily increase their plant in any way.

Serjeant SARGOOD: If I have to put my hand deeper into my pocket because prices have risen, upon what commercial principle do you justify that charge upon me, who am called upon to provide more capital for your benefit, and say, I shall not get as much profit out of it?

Witness: I do not attack you upon that head, but I do not see the reason why the gas companies of the metropolis should be exempt from the operations of trade as they affect other classes of manufacture. In this metropolis there are manufacturers whose chief materials are coal and iron; the prices of those commodities were raised to a very large degree, and their profits were correspondingly reduced; but you, the Chartered Company and others, under the Act of 1868, were entitled to make up any loss of profits accruing from that cause by charging it wholly upon the consumers, and bearing no portion of the risk or loss yourself. I say that is contrary to the commercial and manufacturing policy of this country.

Serjeant SARGOOD: Let me remind you of an ingredient in the manufacturing policy that you leave out—that while manufacturers when prices are raised are compelled to put up with less profit, because they cannot get it, when prices are down they have an opportunity of making all the profit they can as a set-off against that contingency?

Witness: But they are subjected to all sorts of competition. One law of political economy clearly is, that where capital is engaged in a direction in which it is making large profits, there is a rush of capital in that direction.

Serjeant SARGOOD: If you think that commercial principle is a sound one, why do not you undo all legislation you have been concerned in; let the companies have perfect free trade, unrestricted by anything, and take your chance of buying the material?

Witness: If I point out the fact that the streets of London are much confined, and there is not room for a multiplicity of mains, that would be the first answer; but I cannot see that because you are engaged in a manufacture which, under other circumstances, any joint-stock company, without the aid of Parliament, might carry on, and you only require an Act of Parliament to enable you to break up the public streets, which you must accept, whether in the form of a concession or anything else, that because the public grant that concession you are to bind the public down for the maintenance of your dividends at 10 per cent.

Serjeant SARGOOD: What you call a concession is that the public using the gas conceded to us the privilege of putting it into their houses?

Witness: Yes; and not only that, but the Act of Parliament prevents the power being conceded to anybody else.

Serjeant SARGOOD: The manufacturers you have spoken of are not bound to sell their commodities against their will, whereas we are bound to supply gas to you whether we like it or not, and whether we get a profit or not.

Witness: You have undertaken to do it.

Serjeant SARGOOD: We cannot help ourselves. Let me, by way of final illustration, put this to you. Assume, at 3s. 9d., that we can make a profit, but that the cost of things suddenly rises, and it does not give us a profit, what you propose is that, if we put on 3d. and make it 4s., our dividend shall go down?

Witness: Yes.

Serjeant SARGOOD: Supposing that 4s. is exactly the cost price, because when we put it up we must put it up first to meet the cost price, and next something beyond to get a profit; when you have got it up to an amount paying the cost only of manufacture, so that the delivery at 4s. would bring me nothing, upon what principle do you justify that proportionately reduced dividend, which does not exist except in imagination?

Witness: You mean that 4s. will barely pay the cost of production, and would give you no dividend at all? Then I presume you would make the price more than 4s.

Serjeant SARGOOD: Supposing I stop there, on what principle do you justify that proportion of your reduction of my dividend?

Witness: I cannot suppose such a thing possible as that you should stop

there; and I cannot conceive a state of things where 4s., or even 3s. 9d., is necessary for the production of gas.

Serjeant SARGOOD: I will give up those figures. Supposing the normal price is 1s., and your clause comes into operation; the thing costs 1s. 3d., and I sell it at 1s. 6d., you first put me under the penalty for 3d. of the cost by reducing the dividend to a certain point, and put me under another penalty by reducing it again. How do you justify commercially the first half of your proposition?

Witness: Our proposition does not restrict the price at all. You have an unlimited price, but your dividend must depend upon the price.

Serjeant SARGOOD: You do not appreciate my question in the least. Whatever the price may be, the exigencies of the manufacture may compel its increase. When I have increased it by 3d., I only succeed in covering the cost; and when I have increased it by 6d., I succeed in getting 3d. of profits. The operation of your clause is to put a penalty upon me in reference to the other 3d. Why should I pay a penalty as to the first 3d., which only covers the cost?

Witness: We have fixed the price of the illuminating power at what we believe will enable the companies to cover the cost of production and pay the prescribed dividends.

Serjeant SARGOOD: Your Purchase Bill, your Works Bill, and the Regulation Bill were all launched at our head at once, but you have withdrawn two out of the three. Would it be impertinent if I asked how much of the public consumers money you have spent on those two flashes in the pan, because they have been nothing more?

Witness: I should think £3000 would cover it. It has not been nearly so expensive as opposing the two companies before the revisions of 1873 and 1874.

Serjeant SARGOOD: I see the sore point is the cost of the revision. If the referees had knocked 1s. off 3s. 9d. instead of putting 1s. on, you would have thought it one of the best bits of machinery ever invented. But, as the arbitrators thought that the companies were the people to be believed, and not the consumers, that is what my learned friend, Mr. Cripps, has introduced as "the futile experiment of revision," seeing that it was futile as regards your opposition, and very successful as regards our application.

Witness: The whole tenor of Lord Cardwell's report in adopting revision was to enable the price to go down, but he never contemplated its going up. He saw that the manufacture of gas was continually liable to improvement, the profit to increase, and that the consumers ought to be ensured that there would be some probable reduction. It was never contemplated that there would be a loss.

Serjeant SARGOOD: Let me ask you one more question; but I do not know whether you are sufficiently a prophet, or really sufficiently in the secrets of the Metropolitan Board of Works, to answer it. We were encouraged in 1868 to give way to that agitation; we have honestly adopted the proposals of the consumers, and we pledged a million of money to carry them out. Is it your doctrine in the Board of Works that, as soon as you get tired of an experiment of that description, to which the companies are pledged, you are entitled, in the interests of the public, to come here and shuffle it off your shoulders?

Witness: You use such strange terms. To ask me to admit that the Metropolitan Board of Works is prepared to shuffle any question is altogether beside the subject. I certainly think the Metropolitan Board of Works are entitled to change their views according as experience shows they have made a blunder, and I would allow the companies the same privilege.

Serjeant SARGOOD: How could we have undone the legislation of the last seven years, which we have been faithfully carrying out, and pledging our capital to?

Witness: Only by an application to Parliament, in the same way we are endeavouring to undo it.

Serjeant SARGOOD: Having accepted those terms and pledged our money—I put this as a concluding question—would you have thought us honest if, in the year 1873, when we came for a million of capital, instead of leaving the dividend alone, as we did, we had asked for 15 per cent.?

Witness: I should not have said it was dishonest, but I should have said it was extremely foolish.

Cross-examined by Mr. MICHAEL: The Commercial Company are entitled to charge 4s. 6d. without revision, and the privilege of creating a reserve-fund to the amount of one-tenth of their capital. At the present time they are charging 3s. 9d. I believe that company have conformed to the Act of 1860, and have carried out the whole of their duties and obligations with perfect satisfaction. Under the action of our bill we allow the creation of a 5 per cent. dividend deficiency-fund instead of 10 per cent., and we allow the creation of a 5 per cent. reserve-fund; but the latter fund is of no value to make up any deficiency of dividend. The dividend-fund is only to come into operation when 3s. 9d. or less is charged for gas. The moment that price is exceeded, the value of the dividend deficiency-fund becomes lost for that year. Our intention is that they can only make up the reserve-fund equal to one-twentieth of their capital at the time when the price is 3s. 9d. or less.

Mr. MICHAEL: Then the moment they exceed 3s. 9d., they have lost for ever—or, at least, have lost for the year—the dividend. Can they ever make it up in any succeeding year?

Witness: No. We have followed the legislation of 1868 in that respect. If you fix a price which is insufficient to produce 10 per cent., or the prescribed dividend, for the year, the revision of the next year cannot make up any deficiency that occurred then. Supposing the deficiency-fund to be all exhausted in one year, the company would be unable in the next year to make up the dividend. If I may judge by what has occurred with the Chartered and Imperial Companies, I think 2d. on the price of gas represents about 1 per cent. of capital.

Mr. MICHAEL: That is a little in excess. Then if I am obliged to add 10d. to the price of gas—that is, the cost to me is 10d. more—I have lost the whole of my reserve-fund, although it were full?

Witness: Yes. Supposing that lasted four years, you would be without your dividend for that time.

Mr. MICHAEL: Is that your intention? Do you think it fair that there should be that contingency—that for four or five years I should be without dividend?

Witness: That is the operation of the bill; but if you ask as to whether the reserve-fund should be confined to 5, 6, or 7 per cent., that is open to discussion when we come to discuss the clauses. The Metropolitan Board are prepared to support the filled-up bill. Any divergence in it does not depend on me, but it is subject to consideration by the whole board. The board have no desire to perpetrate a hardship upon any parties, and any proper representations would be very fairly considered.

Re-examined by Mr. PHILBRICK: The reserve-fund can never be increased except when the price is 3s. 9d. or under. If the companies charge a price which, according to the terms of the 6th clause would only entitle them to 8 per cent. dividend—that is, if they charge 1s. 4d. more—if it was afterwards found that they ought to have charged 1s. 6d. additional to have enabled them to pay their prescribed sum, then I should say that, as the consumers were eased of payment of that 2d., so the company might make up a dividend of 8 per cent. by drawing upon the reserve-fund.

Mr. PHILBRICK: You were asked some questions with reference to the principles embodied in Mr. Cardwell's report, subjecting each company as it came before Parliament, and according to its necessities, to the restrictions proposed in 1867, which took the shape of an Act of Parliament in 1868, and that Mr. Cardwell's committee had reported that as each company came, then would be the time to subject them to the restrictions or to consider their case. It has also been suggested to you that the companies are not coming here on the present occasion generally, and it is not right to pass any general legislation unless all the companies were coming, or unless all the companies are prepared to accept the bill as proposed; what do you say to that?

Witness: It is not at all inconsistent for Parliament to impose regulations. It was acknowledged by Lord Cardwell's committee that the bill of 1860 had not satisfied the requirements of the consumers, and he altered it in respect of certain parts. There is nothing to my mind inconsistent in the present committee recommending to the House such regulations as would place proper restrictions upon all the companies, so as to enable them to carry on their works in the interests of the consumers as well as that of the shareholders. That objection would apply to any regulation bill in principle, and it would certainly apply to one regulation bill—the City of London Act, which did alter another regulation bill of 1860; and if the City of London Act, which is a regulation bill, could alter the regulations of 1860, clearly an Act in 1875 may properly alter the regulations of 1868.

Mr. PHILBRICK: Then with regard to such a regulation bill, having seen the letter from the President of the Board of Trade to the chairman of the present committee, would a regulation bill appear to you, having reference to what is stated in that letter, to be consistent with the views of the Board of Trade?

Witness: Certainly, if the bill were prepared on the basis of that letter, it must be a regulation bill.

Mr. PHILBRICK: If the object of the commissioners, in settling a price and a revision, is to reach a certain sum of money, which is a prescribed rate upon the capital and upon the trading—a sum sufficient to make up the dividend—what does the initial price to be charged matter?

Witness: Not the slightest. Every shilling of money spent on the works, and every increase made in the officers salaries, and every increase of fee paid to the directors, is paid out of the consumers pocket, and not out of the shareholders pocket. In the manufacture of gas, the companies have not only such accidental things as may occur from new discoveries, and applying residuals to beneficial purposes, but from time to time such appliances as science brings to bear, and there is also the increased consumption which new industries create.

Mr. PHILBRICK: Some questions have been put to you with reference to the terms at which the Chartered Company, after they had accepted the legislation of 1868, raised fresh capital, and the opposition of the Metropolitan Board to the proposal to raise it at 10 per cent. in 1872. What effect had the raising the capital at 10 per cent. upon the gas consumers?

Witness: It threw upon the gas consumers the necessity of providing a dividend to get the 10 per cent. for that increased capital. The object of the opposition of the Metropolitan Board was to insist, if possible, that the capital should be raised at a lower rate than that of 10 per cent. The company, in their own bill of this year, stated that their capital, when raised, ought to be exchanged for Consols. If that is so, every time they raise £100 stock, with a guaranteed dividend, it is worth £300 in the Consolidated Fund.

Mr. PHILBRICK: On that occasion, supposing they could have raised capital at 6 per cent., the difference between 6 and 10 involved a permanent charge upon the gas consumers of the metropolis, which no economy can touch, of £40,000 a year?

Witness: Yes, and that the commissioners are not empowered to inquire into.

Mr. PHILBRICK: As to your endeavouring to get the dividend upon the new capital limited to a certain amount, in the interest of the consumer, do you consider that any breach of faith on your part?

Witness: No, I think they should raise the capital on more economical terms.

Mr. *George Shaw*, examined by Mr. O'HARA.

I am chairman of the Gas Committee of the Corporation. The bill now before the committee has been promoted by the Common Council and the Metropolitan Board of Works, and the part my committee take is owing to the express wish of the Corporation. I concur in a great part of what Mr. Newton said. The Act of 1860 was the commencement of the feeling of dissatisfaction in the City, because it was felt that that Act was advocated under the belief, on the part of the public, that it would avoid the many nuisances that arose from the continual opening of streets for laying gas-pipes, which very much impeded traffic. It was also pleaded by the companies that the lessening of expense which would arise by not opening the streets so often, would in part be considered in the price of gas to the consumers. The immediate effect was that, instead of considering their consumers, the companies added very much to their dividends. One of the objections we have to the Act of 1868 is the revision clauses, which were found to be a complete mockery. They were originally intended in the interests of the consumers as well as of the companies, and were accepted as, in some measure, a modification of the evils then existing. We believed they would be of great assistance, but in working out we have found it has been quite the opposite, and have taken a totally different direction to what we expected.

Mr. O'HARA: With reference to the question of due care and management, do you, as a man well acquainted with business, think that the conduct of the Imperial Company in the conversion of a large amount of loan capital bearing 5 per cent., into 10 per cent. shares, was evidence of due care and management?

Mr. RICHARDS: I will take your opinion whether, as regards what the Imperial Company did in 1866, this gentleman's opinion is worth a straw, or whether it has anything to do with the case now before the committee?

Mr. O'HARA: Yesterday Mr. Newton was cross-examined by Sir Edmund Beckett, who asked, "What do you know about due care and management?" and Mr. Newton told him what he considered a great waste of money upon the part of the Imperial Company. I am surely at liberty to get from this gentleman whether he considers turning a 5 per cent. loan into 10 per cent. share capital was evidence of due care and management.

Mr. RICHARDS: This witness comes from the City of London, with which the Imperial Gas Company have nothing to do. I am at a loss to understand why a commercial gentleman is to be put into the box to give an expert's opinion as to whether a certain thing the Imperial Gas Company did in 1866 was or was not within the terms of due care and management; whatever his answer may be, it has no application to the bill before the committee.

Mr. O'HARA: This gentleman says that the revision clauses, as they exist, are perfectly futile without the possibility of ascertaining how capital has been expended, or loan turned into share capital, and without all these safeguards necessary to make the inquiry a really useful one, and one satisfactory alike to the consumers and the companies.

The CHAIRMAN: You must limit your questions, with reference to the revision clauses, to what happened after they were passed. I do not think a fact that happened before would be illustrative of that.

Examination continued: In my opinion, the revision was distinctly not a useful one to the consumers. It was felt to be a complete sham. When the inquiry came on before the commissioners, and an attempt was made on our part to ascertain how the capital had been expended, we were met by an intimation from the commissioners that it was not within their province to make such inquiries. The opinion that the committee of the corporation and the citizens generally formed is, that these revision clauses are totally inoperative in reference to what we expected of them when the Act was passed. The City took great trouble to promote the Act of 1868, believing, among other things, that these clauses would be of very essential service in keeping down the price of gas; that, when revisions occurred, we should be enabled to raise any questions as to the application or expenditure of capital, and other matters touched upon by the Act; but when we found we were prevented going further than simply having access to the returns the company furnished,

stating that it required so much to cover their 10 per cent., and that no further inquiry was allowed, we felt there was a failure in the effect of those clauses.

The CHAIRMAN: The committee do not wish to check the promoters in any evidence they think fit to produce, but it might lead to the saving of time if it were taken for granted that there is an agreement between the Corporation and the Metropolitan Board.

Witness: The corporation quite agree with the course taken by the Metropolitan Board. There is, however, one point which I do not think has been much referred to, that is the question of the test-burner. It is a matter of detail, but I think it is one of the most important points in the question. The arrangement in the 1868 Act was that 16-candle gas should be given, but we have found it no better than, scarcely so good as, the old gas.

Serjeant SARGOOD: Before the Revision Commissioners neither the companies nor the consumers asked for any change in the illuminating power, and therefore, though the commissioners had an opportunity of taking that question into consideration, and if it had been raised they would necessarily have discussed the burner, the subject was never before them, and I think that is a reason why it should not be gone into now.

Mr. PHILBRICK: They have no power to raise the standard above 16 candles, and our complaint is that what is called 16-candle gas now, is not equal to 16-candle gas as intended by the Act.

Witness: The claim of the company for a higher maximum than 3s. 9d., upon the plea of their furnishing 16-candle gas, was conceded by the corporation under the belief that they would really have two more candles illuminating power, but we actually find it is not so. It is only by the test-burner used by the company, one that is not possible to be used by the public generally, that this illuminating power is ascertained, so that it is apparent and not real. The following letter is in reference to this question of the test-burner; it is dated July 7, 1874, and addressed to the town-clerk from the referees:—

Sir,—In May, 1873, we received a letter from the town-clerk of the City, enclosing correspondence and papers with reference to the burner prescribed by our predecessors for testing the gas supplied to the City. The Gas Committee of the City appeared to be of opinion that the burner in question did not comply with the condition laid down in section 43 of the City of London Gas Act of 1868; that it should be "practicable for use by the consumer;" and we were requested to take the matter into consideration with a view to prescribing a burner that would comply with this condition. We have delayed replying to the above-named communication, partly to give extended time for the trial of the burner by the public, as shown by its sale, and also in order that some of our body might subject the burner to direct trial for household use under their own observation. We learn that to the present time upwards of 50,000 burners, similar to the test-burners, have been sold to the public, and that the sale of them is increasing. The results of our own trials of the burner have been satisfactory. We are therefore of opinion that the burner does comply with the condition required by the Act, and we see no reason on this ground for disturbing the prescription of our predecessors.—We have the honour to be, sir, your obedient servants,

A. VERNON HARCOURT.
WILLIAM POLE.

This really is an answer in confirmation of our view, that it is not applicable for the consumers, when we are told that in some years (and these are statements which there is no mode of testing) 50,000 burners were sold to the public, what would be the number of burners required by the inhabitants of London? Some millions.

Mr. O'HARA: Do you know personally of dissatisfaction amongst consumers in the City?

Witness: There is no doubt that it is general and deep-seated throughout the whole City. In fact, the Act of 1868 is a complete disappointment. We took up the question in 1866, for the purpose of dealing with what we felt to be anomalies; and, finding that we had failed in that, we tried again in 1868, believing that we had secured something that would be of service, until it was attempted to work it, and then the whole thing fell through.

Cross-examined by Mr. RICHARDS: When we came to put in operation the revision clauses, we found the Act totally unworkable. We object to these clauses and to the test-burner applied for the purpose of giving what is an illusory illuminating power. I am not aware of anything else that is objected to. There is no doubt the question of amalgamation. I do not know whether it is affected by the Act, but we suffered much in the City by the amalgamation. The Revision Commissioners were, no doubt, most impartially selected, and were very competent men.

Mr. RICHARDS: Had the result happened to go the other way, should you have objected to the revision clauses? Supposing the commissioners said the companies were not entitled to raise their prices?

Witness: I do not know what you mean. I believed the Act of 1868 would work very well, but the result has been a disappointment.

Mr. RICHARDS: To the unsuccessful party?

Witness: We have no special interest in this; we are only a body representing the public.

Cross-examination continued: When the Acts of 1868 and 1869 were passed, the revision clauses were introduced to meet exigencies that might arise. We adopted those clauses, believing they would work well. The first time they were put into operation we, representing the consumers, were unsuccessful, for the reasons I have stated. Naturally, we did not like it, because we found the heading of the bill and of those clauses was totally different from what we expected.

Mr. RICHARDS: It does sometimes happen that a defendant who gets damages against him does not like it. As to the test-burner, in neither of the revisions was any application made for an alteration of the illuminating power?

Witness: I do not think there was. We had, in fact, come to the conclusion that, although it was 14-candle gas simply made 16-candle by the use of a special burner, we would accept it, and so prevent any further tampering with the question by the introduction of other test-burners.

Mr. BRASSEY: Supposing, in place of a great increase, there had been a great fall in the price of coal, how would the revision clauses have worked in that case?

Witness: It would have been for the commissioners then to have decided upon the matter, as there is no doubt they would have had the power of lowering the price of gas.

Mr. RICHARDS: You would not have objected to the revision clauses if they had brought about a reduction in price?

Witness: We only desire they should work fairly.

Mr. RICHARDS: What should you have said as to the honesty of the companies if they had then objected? Would you not have said that they were dishonest?

Witness: I do not think I should have said they were.

Cross-examination continued: The question of illuminating power was not raised before the commissioners; we were content with it as it stood. The commissioners could have lessened the price by the reduction of the illuminating power; but we felt that by such reduction we should almost have sent London into darkness.

Mr. RICHARDS: You complained that the test-burner was an improper one, and yet the referees, in the letter you read, say they, for reasons stated, do not see any necessity for a change?

Witness: Yes; but we have the evidence of our own senses, and also that of the gas examiners, in confirmation of our complaint, as, if it had been proper for consumers, 100 times the number would have been sold. We say it does not comply with the spirit of the Act, which says it shall be such a burner as shall be convenient to the consumer.

Mr. RICHARDS: The gas referees say that it does. Who is the constituted judge by Act of Parliament, you or they?

Witness: The referees; but it is open for any public body to discuss the question.

By Mr. TALBOT: The Chartered Company supply the whole of the City now. The Act for amalgamation was passed in 1870. I have the report of Dr. Letheby in 1869, which enables me to form a judgment as to the difference in the illuminating power of the gas in parts which were not formerly supplied by the Chartered Company. The effect of my own experience is, that the gas is not so good as formerly. The Chartered Company supply gas of higher illuminating power than the other companies; but in my opinion it is not so bright.

Mr. BIRLEY: Do you think the system of revision can be made practically to work so as to fix a fair price for the gas, and to ensure due care and economy in the production of gas by the respective companies?

Witness: Not as they at present exist and are interpreted. I do not think it possible to make them workable for useful purposes. I do not see how the commissioners can ascertain whether the companies are carrying on their business with economy, because they are not practically acquainted with the manufacture, and it would require some person with that special knowledge. Assuming that they were practically acquainted with it, I am not aware that they could even then ascertain it.

Mr. BIRLEY: Are you practically acquainted with it yourself?

Witness: I have great practical acquaintance with it.

Mr. BRASSEY: Have you tested the quality of the gas supplied on your own premises?

Witness: Yes, by the ordinary means of one's experience—the eye. I employed no instrument. Possibly a judgment given without the assistance of an instrument might be very imperfect, but scarcely to the extent of two candles; besides, it is so generally felt by many whom I know to have a strong impression about it.

Mr. WEST: Are you aware that, under existing Acts of Parliament, there is a daily testing of the illuminating power of the gas which is sold by the Chartered Company, who supply the whole of the City?

Witness: I am perfectly aware of it; it is under our own officers it is done.

Mr. WEST: Have they ever made any complaint of the illuminating power of our gas?

Witness: There is at present no complaint of the gas not being up to the standard of 16 candles; but what I have stated, and will repeat, is that 16 candles by the present test-burner is not 14 candles by the testing system previously used.

Mr. WEST: Although you appoint officers to test daily the illuminating power of gas supplied to you, have you ever made any complaint with regard to that illuminating power?

Witness: We have only complained to the referees, I think.

Mr. WEST: If you have been living under this state of things for years, and complained bitterly of it, your officers must have made some complaint; there are enormously heavy penalties to be inflicted upon the Chartered Company if they do not prove that their gas is up to the standard ordained by the Act of Parliament. Do you mean to say that you never knew of a single complaint?

Witness: Yes, I have known of complaints.

Mr. WEST: Give them to me.

Witness: I have not the dates of those cases.

Mr. WEST: To-morrow morning can you give the complaints made, and the amount of penalties inflicted upon the Chartered Gas Company during the whole time that they have supplied the City?

Witness: I can bring whatever information I have got upon those matters; whether I can bring it in the way you want, I cannot say.

Mr. WEST: Surely the chairman of the Gas Committee should know whether these penalties have been enforced?

Witness: No, I do not.

Mr. WEST: Can you give a single instance of any penalties being sued for, or enforced against the Chartered Gas Company, for not supplying gas of a proper illuminating power?

Witness: I cannot give it now.

Mr. WEST: Under the Act of 1868?

Witness: No.

Mr. WEST: Are you not aware (you are the person who ought to know it) that the average illuminating power of the Chartered gas has always been considerably above that which the company are compelled to give under their Act of Parliament?

Witness: It has.

Mr. WEST: With regard to the legislation of 1860, I understood the advantage you thought you would gain by that Act was that the streets would not be torn up and interfered with. Have you not gained the full advantage?

Witness: Yes, in that respect, but not all the advantage. I said the expense thus saved to the companies would, we were told, be considered in the price of gas to the consumers. And it has been—by raising it.

Mr. WEST: Not at all; it has diminished it. You do not mean to tell the committee that, if they had had to break up the streets and lay down new mains, it would have lowered the price of gas either to the consumer or seller?

Witness: The effect was that it did entirely away with competition, and established monopoly. We have had peace and quiet in the streets, but at the expense of the citizens. We have been precluded from having a healthy system of competition, which we think very desirable in all matters. This is a monopoly, and it ought to be so regulated that the interests of both parties should be considered.

Mr. WEST: With regard to the proceedings before the Revision Commissioners, I have not yet heard what you complain of. Were you not satisfied with the way in which they conducted the inquiry?

Witness: Quite satisfied, so far as they could inquire; but they were prevented from touching upon those points upon which we thought it most desirable that an inquiry should be made. We were not permitted to inquire into the expenditure of capital or the raising of capital.

Mr. WEST: It was never intended that you should inquire into the matter, was it? That was a question which did not come within the Act. Now tell me another?

Witness: The effect of the revision clauses was to create general dissatisfaction in the City, and it has been so deep seated that it has induced the corporation to assist in the promotion of this bill.

Mr. WEST: I think you must have fallen into an error just now. I understood you to say that before the commissioners you were shut out from going into the question of burners by the letter you received from the referees, which you read?

Witness: We were not prevented; we thought it useless under the circumstances.

Mr. WEST: This letter was not written until two years after both investigations. How could you have been prevented when you went before the commissioners in March, 1874, and July, 1873, by a letter which was not written until July 7, 1874?

Witness: That is the closing of a correspondence extending over a very long time; and, if I had known that it would have been of service, I could have brought the whole correspondence.

Mr. WEST: These are perfectly different commissioners. How could you argue that you were prevented going before Mr. Reilly and other commissioners by the correspondence which you had with referees subsequently appointed?

Witness: I do not say that we were prevented.

Mr. WEST: What prevented you going before the referees?

Witness: We complained to the referees, and that is the result of correspondence extending over a considerable time.

Mr. WEST: Confining yourself to the commissioners who investigated the matter, why were you prevented, in those two long inquiries, from going into the only ground of complaint which you have made? Why did you not go into the question of burners?

Witness: The only way we could touch the illuminating power so as to affect the price would have been by lessening it, but we felt it was impossible to justify an application for any less illuminating power than was there stated.

Mr. WEST: It was in the consumers interest that you did not go into the question before the commissioners; it was never brought before them either by you or anybody else?

Witness: We could not agree to any decrease of illuminating power.

Mr. WEST: Was it brought before the commissioners, or were they asked to adjudicate upon the question of the burners?

Witness: No, because we decided in committee not to do so.

FRIDAY, JUNE 4.

Mr. *George Shaw* recalled, and cross-examined by Mr. VENABLES.

So far as it affects the City, amalgamation has been against the interests of the consumers; because, if the Great Central Company had not been amalgamated with the Chartered, there is no doubt but that the citizens would have had gas at a much lower rate than they have had to pay for it since. In the case of the Great Central Company they were earning more than 10 per cent., and, consequently, would have had to reduce their price.

By Mr. O'HARA: My main objection is to the test-burner; but I also object to the position of the testing-place. We have reason to know that the illuminating power of the gas in districts throughout the City, besides where the appointed testing stations are, is not up to that returned by the examiners. That is the reason why we have asked in our bill that the testing-place shall be in the district where the gas is consumed. I was asked yesterday as to whether the corporation had made any complaints in reference to the Chartered Company's Act of 1868. I stated complaint had been made about illuminating power. I find I was in error in that matter; but it was so much mixed up with the other that there was very good reason for the mistake. I referred to the letters written by the referees, and with the permission of the committee I will read one which was written to the Board of Trade on the matter, dated the 3rd of August, 1871. [Witness read part only of a letter, signed T. Foster, and addressed to W. R. Malcolm, Board of Trade.]

Mr. WEST: What has that to do with the illuminating power? I asked this witness what complaint he had made with reference to the Chartered Company as to the test-burner and the illuminating power, and he now reads a long correspondence as to the want of purity in the gas; that has nothing to do with the illuminating power or the test-burner.

Mr. O'HARA: He has answered my question, which was as to the complaint made by the corporation to the referees; he has now read the answer from the referees upon the subject, and now I ask him this question. Your objection to the present mode of testing is that the testing is not in the district where the gas is consumed?

Witness: That is so.

Mr. WEST: All that ought to be struck out; we never heard a single word in the examination-in-chief about any impurities in the gas.

The CHAIRMAN: I do appreciate your objection as a matter of form, but as a matter of real meaning it is very difficult for the gas to be impure without in some way affecting its illuminating power. I do not know that much is gained by putting these questions, because the parties to get this evidence from will be the engineers.

Mr. PHILBRICK said that Mr. Newton in cross-examination was asked a question about the estimate for coal put before the commissioners, and he said he would refer to the passage if he could find it; it is as follows: "Out of the total quantity of coal required in 1874 (in addition to that in stock on the 1st of January) to produce the quantity of gas for sale as estimated by the company—namely, 428,201 tons—the company had at the beginning of 1874 left 74,185 tons only uncontracted for. Having regard to the facts that the price of coal during 1873 was considerably above the average price of the preceding period of seven years, and was continuously falling throughout the year, and to other considerations, we think that with due care and management the company would have left a larger proportion of the required coal uncontracted for, and would thereby, in the events which have happened, have saved for the consumers a considerable sum. We accordingly deduct a sum from the company's estimated outlay for coal in 1874; or, in other words, in arriving at the price of gas, we disallow that sum as an outgoing of the company. We also put on the quantity of coal left uncontracted for a somewhat lower price than that estimated by the company."

Serjeant SARGOOD: Is this to show that they could not entertain the question of due care and management?

Mr. PHILBRICK: It applies to that. Then there was one other matter which the committee asked for—the population of the districts served. We have taken the census on the returns of 1871, but as the gas companies districts are not quite co-extensive with the parishes, we have been obliged to estimate them as well as we possibly can; but if my learned friends who represent the companies have accurate figures, we shall be very glad for them to be put before the committee instead of these.

Mr. *George Thomas Livesey*, examined by Mr. PHILBRICK.

I am engineer and secretary of the South Metropolitan Gas Company, and also a member of the Institution of Civil Engineers. Last year I was president of the British Association of Gas Managers. During the whole of my life I have had considerable experience in the manufacture of gas, and have directed considerable attention to the various improvements which have been made from time to time in its production. My father was secretary to the company for 30 years. There is nothing exceptionally favourable in the circumstances of our company, or in the Act under which it was created, or in the district we supply, to render our company an unfair one to take as a sample of the London companies. There are large portions of our district somewhat sparsely planted with houses at this moment, when our mains and standing plant are not earning so much as in the better portions of the district. Since 1864 our dividends have been at the uniform rate of 10 per cent. The price was 4s. in 1864, and it was reduced to 3s. 8d. in that year. It was reduced to 3s. 4d. in 1865, to 3s. 2d. in 1869, and to 3s. in 1872, all without meter-rents. We have not earned 10 per cent. during the last two years but we have paid it. In 1872 and 1873, when the exceptional circumstances of the coal supply occurred, our company did not increase the price to the consumers. I calculate the meter-rent is equal to 1d. or 1½d. per 1000 feet. Under our Act of 1869 the quality of our gas is fixed at 14-candles, but by the new burner fixed by the referees the average illuminating power has been a trifle in excess of 16 candles. The shortness of coal began to be felt in the last months of 1871, but it was not really great till 1872, in the spring of which year our contract for coal was made, at an advance of 2s. 6d. a ton, free on board in the Tyne. In 1874, while coal went down to some extent, coke also went down in a greater proportion, so that our profits were not quite so good as in 1873; but coal was at its highest price in 1873. Our company has revision clauses under its Act, but we have never applied to the Board of Trade for an increase of price above the maximum, and never will if we can help it. Our maximum is fixed at 3s. 6d. As a gas engineer I have watched the operation of the revision clauses very closely, and twice last year I was officially summoned by the commissioners themselves. I consider that the revision clauses absolutely protect the companies against all losses of trade or losses arising from carelessness, or neglect of management, and that they do not protect the consumers in any way whatever, and that the phrase "due care and management," as carried out by the revision clauses, is a perfect myth.

Mr. PHILBRICK: Intimately acquainted as you are with the manufacture of gas and with the mode in which you would scrutinize the manufacture, or the trading and working of the company, is it, in your judgment, possible that any public authority could scrutinize the working of the company efficiently, so as to put their finger upon the blot, if there be an absence of due care and management?

Witness: My opinion is that it is not in any way in the power of the commissioners to control expenditure, and that they cannot put their finger upon the blot.

By Mr. BIRLEY: By "expenditure," I mean the money expended in the management of the concern. The commissioners must accept the management of the company.

Mr. PHILBRICK: Supposing the function of the commissioners be as the statute suggests, to allocate the sum which must ensure the maximum dividend, in your judgment, what protection has the consumer?

Witness: I agree with what Mr. Newton said—none at all. In fixing the price of gas, there are two or three matters to be considered; first, what may be called the manufacturing part, in which the price of coals and iron, and the commodities used, largely enters, labour, and so forth. There is also the mode in which the works are disposed, the modern appliances brought to bear, the care and management used in the application of the processes, and the mode in which the residuals are disposed of. We contract for our coals on the one hand, and dispose of our outgoing products on the other. There is another very important matter—capital, and the mode in which the financial business of the company is regulated.

Mr. PHILBRICK: Having regard to these matters, which are component elements in the price which the gas costs the company before it leaves their works, what plan would you adopt for protection to the consumers, and at the same time give the company a fair protection?

Witness: I am thoroughly persuaded that the only satisfactory plan would be to make it to the interest of the company to do the best they can for the consumers, and that no regulation of any kind would be effective; but were it distinctly the direct interest of the company to serve the consumer, then the consumer would be well served. Nothing that authorizes the interference of a third body, whether a local authority or the commissioners, or anybody else, with the internal working of the company, could be satisfactory or useful. You must leave the manufacturer to carry out his own concerns, and hold him responsible; in other words, judge him by his results, as I wish the South Metropolitan to be. If it is the common interest of both that those results should be such as only to ensure to the company a fair amount of protection, and permit them to earn their money, I would also strive to make it consistent with the lowest price at which gas could be supplied. I think the true interest, both of the company and of the consumer, is to produce the gas at the lowest remunerative amount.

Mr. PHILBRICK: How do you think you would attain that object?

Witness: I made a statement last year, which explains the principle clearly, I think. I would attain the object by means of a sliding scale, and let the dividend depend upon the price charged for the gas. In my address to the British Association of Gas Managers, there are a few remarks on our legislation, which I dare say you would like to see. [Witness read several extracts from his address, which were fully reported in the JOURNAL OF GAS LIGHTING, vol. xxiii., pp. 837 and 838, under the heading, "Recent Legislation as affecting Gas Companies."] In making these remarks, I was addressing an audience skilled in the manufacture of gas; at that time I was not aware of the bill now before the committee, as it was not in existence. I have seen the present bill, as amended on the part of the Metropoltian Board and the corporation, and I think the local authorities, in fixing 3s. 9d. in their bill, have dealt in a spirit of great fairness to the companies.

By the CHAIRMAN: It would be 3d. above our present maximum, but it gives a higher illuminating power; ours is 14 candles, and 3s. 6d.

By Mr. BRISTOWE: All the companies would be able to charge for meters over and above the 3s. 9d.

Examination resumed: The 3s. 9d. would be 9d. more than we are charging, but not 9d. more than it costs us to make. I think the London companies ought to make and sell gas at 3s. 9d., so as to pay their shareholders the dividend, which by law they can pay, to the full extent.

Mr. PHILBRICK: Assuming that they managed their works well?

Witness: I do not assume that they have managed their works badly.

Mr. PHILBRICK: It always underlies the whole of the evidence to assume that?

Witness: Yes.

Mr. PHILBRICK: Have you a detailed statement as to the cost of gas per 1000 feet?

Witness: The best answer I can give to that is to give the cost to my own company during the past four years. I prefer to state actual facts, and I take 1871 as a normal year.

Serjeant SARGOOD inquired whether it was the intention of the committee to review the question of the price at which gas could be manufactured, seeing that the initial price in the present bill did not vary the initial figure of 1868; because, if so, it would be a fortnight's inquiry.

The CHAIRMAN said he could not see any reason for stopping the question.

Witness: In 1871, which was a year unaffected by the coal, and with coke at the old ordinary rates, it cost us, by Mr. Field's book, 1s. 11¾d. per 1000 feet to make the gas; that is inclusive of all charges, and after allowing for the sale of residuals. Perhaps I had better put it in this way. In 1871 the coal cost us 14s. 2d. per ton, and the gas was made for 1s. 11¾d. per 1000 feet. In 1872 coal cost us 16s. 7d., and the gas was made for 2s 0¼d. per 1000 feet. In 1873 coal cost us 24s. 10d., and the gas was made for 2s. 1¾d. per 1000 feet. In 1874 coal cost us 20s. 7d., and the cost of gas was 2s. 2¼d. per 1000; that is, per 1000 feet sold. In that cost I have included leakage and all unaccounted-for gas, and it is upon those figures that the company would earn their dividends. The figures I have given include everything except dividend, which comes to something under 1s. In 1871, it was 11¾d.; in 1872, it was 11¾d.; in 1873, 11¼d.; in 1874 11¼d.; that is per 1000 feet sold. The whole of capital on which I calculate that dividend—that which causes the 11¼d.—is a 10 per cent. capital. We never had any money raised by loans at a less amount. We had to draw in 1873 upon our reserve-fund to the extent of about £5000, and about £6000 in 1874; 1¾d. in 1873 on the price would have given us full dividend, and about 2¼d. in 1874 would have done the same.

By the CHAIRMAN: We really reduced the price of gas 2d. after the coal began to go up.

Mr. PHILBRICK: Though you had power of putting up your price, you preferred not to do it?

Witness: We could not do it with the reserve we have.

By the CHAIRMAN: We had our reserve-fund made up fully in 1863 to £20,000; from that date, notwithstanding the reductions, a small balance accumulated year by year. In 1864, we found, with our reserve-fund of £20,000, we were still accumulating, and the price was reduced 4d. to prevent further accumulation; but the elasticity of the business rather exceeded the reduction, and so there was a slight accumulation in the following year, until in 1872 we had £17,000 in excess of our reserve-fund over what we had any right to have. We therefore reduced the price 2d. after the coal had gone up 2s. 6d. a ton, in order to absorb the £17,000. If coke had not realized a much higher price than we expected, the £17,000 would almost all have gone in that year; as it was, £5000 went in 1873, and £6000 in 1874, and we

have about £5000 left now. I think this year we shall come out about level with 3s.

Mr. TALBOT: You put a lower price in order to absorb the surplus over the reserve-fund, but you will not be able to retain that price when you have absorbed it?

Witness: We are this year making our dividend at the 3s. price.

By Mr. BRASSEY: The price of coal has fallen, which enables us to do that.

By Mr. BRISTOWE: The parliamentary reserve-fund remains untouched.

Examination resumed: When we came in under the Act of 1869, we were allowed to retain the reserve-fund we then held, but not to put any further moneys to it. I imagine we are under the same conditions as the Imperial. If we draw from that reserve-fund of £20,000 we may fill it up again.

By Mr. BRASSEY: If we have to encroach upon our reserve-fund of £20,000, I certainly believe we may then raise the price of gas.

Mr. CRIPPS: In order that there may be no mistake about the matter, I will state that by the legislation of 1869, although they might have gone on dipping into the rest of that reserve-fund as long as they had it, they had no power of recouping the reserve-fund when it was gone; they have an insurance-fund for other purposes, such as extra care cannot prevent, but the reserve-fund, if once gone, cannot be restored again.

The CHAIRMAN: This evidence is valuable to us, as showing the result of due care and management.

Witness: I read that clause differently to Mr. Cripps. It is a long clause, but in the end it is provided that it "shall not be lawful for the company to set aside any profits for the purpose of forming an insurance-fund until the reserve-fund which they have created by virtue of the Acts relating to the company has been reduced below a sum equal to one-twentieth part of the paid-up capital of the company; but such reserve-fund shall, in the meanwhile, be applicable to the purposes for which it is formed, and also for the purposes of an insurance-fund."

Mr. PHILBRICK: So that when it comes to that limit it will become an insurance-fund. One understands enough about the manufacture of gas to see that the price and the illuminating power depend mutually upon each other. Will you be kind enough to explain your view upon the subject of raising the standard so as to make a level 16 candles throughout the metropolis?

Witness: Practically, if you fix the minimum at 16 candles and subject the companies to penalties if their gas is below that minimum power, you compel them to give something like 17½ candles; there must be a margin of safety. My objection to that 16-candle minimum is quite as much in the interests of the consumers as in the interests of the companies. In order to secure that margin of safety, a considerable but a varying proportion of cannel coal must be used. This cannel is not only expensive, but it is difficult to obtain, and it spoils the coke. The use of it will increase the cost of gas much more than the value of half a candle obtained by its means. Last year we used hardly any cannel, practically we did use once or twice a little, but very little, for exceptional purposes. I have the returns of the official testing during the last year. In the first quarter of the last year our maximum quality in one day was 17½ candles, minimum 14½; in that quarter the average was 16½. In the June quarter, 17·4 maximum, minimum 15·3; the average being 16½. In the September quarter, 17·4 maximum, 15·8 minimum; 16½ average. In the December quarter, 17·4 maximum, 15·3 minimum; average 16½. That is the worst quarter for us; when we are under most difficulties in the management.

By Mr. TALBOT: In severe frosts we find a difficulty in keeping up the illuminating power.

Examination resumed: Frosts are one of the contingencies to which a gas manufacturer is subject. With reference to the question of illuminating power, I should agree to a minimum of 16 candles, with some alteration of the clause as to penalty. I do not think it would be fair to the gas companies to expose them to a penalty for half a candle below 16, if by accident they went down to that. In the interests of common fairness I should alter the 35th clause, by saying for each candle defective power, instead of each half candle.

Mr. PHILBRICK: Perhaps more for the information of us all than anything else, let me ask you this. The way in which the gas is tested is by making the shadows impinge on the screen of the photometer?

Witness: I have here a disc that is used for testing the gas. This is simply a piece of blotting paper saturated with spermaceti except the spot in the centre. This screen is placed between the two lights to be tested, gas on one side and candles on the other; I should say that the colour of the light from gas is not quite the same as it is from candles. You move this disc until the spot in the centre becomes perceptible from both sides. In my experience it depends, to some extent, upon the eyesight of the operator; in depends to some extent upon his experience, and I do not think it is possible to say what is the quality of gas within half a candle, with the same certainty that a chemist would weigh the product in the scales.

Mr. BIRLEY: Surely it might be made so; you could easily construct an apparatus not liable to those divergences?

The CHAIRMAN: You cannot get any machine that will be entirely independent of the operator's eyesight?

Witness: No.

Mr. PHILBRICK: So that you would say, still give the 16 candles, but do not enforce the penalty unless there is a defect amounting to a whole candle?

Witness: That is my opinion. Practically I would say that with such an arrangement the public would always get gas in excess of 16 candles. I think the local authorities ought to have the power, if upon any occasion it falls below the stipulated quality, of sending a remonstrance to the gas companies, and the feeling of the gas companies is so strong against being in default with respect to their illuminating power that they would avoid it if possible.

Mr. PHILBRICK: Supposing there were a continuous deficiency in one case of, say three-fourths of a candle, or nine-tenths of a candle, what would you say?

Witness: I do not think it would be continuous, but you would not have any security under my proposition. If you took the penalty at the rate of 20s. for every half candle, in our case it would come to nearly £50 a day, which would be double the value of the gas. I know the capital under which the various London companies are working, and taking the several amounts they would require, I still think with 16-candle gas at 3s. 9d. they ought to pay their full dividend. With regard to the question of impurity. The ammonia we can deal with, but as to the sulphur compounds, the fuss made about them has driven all the engineers of the London companies mad.

Mr. PHILBRICK: You do not believe they are so bad as the gas referees think they are?

Witness: I do not know that the gas referees think they are so bad. They are bound to prescribe the limit of impurity under which we are to supply gas, but I do not think the sulphur compounds are injurious to health; they may be to brass-work. In reference to the question of sulphur, I think it would be perfectly fair not to subject the companies to penalties except for default during a certain number of days, taking the average of a week. My reasons for this are as follows:—In the first place, it is very difficult to test; it takes 24 hours to work out the test for these sulphur compounds, so that your gas may be bad to-day, and you do not know it until to-morrow, and you cannot rectify it until the day after. Therefore, if you give an average of a week it would give us an opportunity to recover. Further, I do not think that an excess of sulphur during any one day, supposing it is within any reasonable limit, is noticeable or injurious in any way. Really, if you have 30 grains one day, and 20 grains another, its effect is practically the same as if you had 25 grains during two days. If you allowed an average of illuminating power in the same way, I say it would be positively injurious to the public to allow the gas companies to send out 12 candles one day and 20 another, in order to make an average of 16 candles.

By the CHAIRMAN: The discolouring of ceilings by gas is owing to the imperfect combustion of the gas by the burner, and not to the sulphur. It is carbon, or soot really.

Examination resumed: The average for illuminating power should not exceed one day, because it would not be fair to the public; but the average for sulphur extending over a week would be perfectly fair to the public, and could not be offensive to the gas companies—or, rather, to the engineers, because it is they who suffer all annoyance from it at the present time.

The CHAIRMAN: When we feel that we have a reason to complain of the gas being what we consider dirty, what we ought to complain against is the burner and not the gas?

Witness: In 99 cases out of 100.

By Mr. BIRLEY: The sulphur found in gas does not affect the burner very much; 30 grains to 100 feet is only one-thousandth part of the gas.

Mr. BRISTOWE: Then you object to clause 19 of the bill, if I understand you rightly, which provides that the gas shall be pure and free from sulphur?

Witness: That is sulphuretted hydrogen, which is an impurity we can deal with and test in five minutes.

Examination resumed: Sulphuretted hydrogen is a well-known impurity, and its chemical composition and the manner of dealing with it is well known. The chemists have found out the sulphur compounds; but they have not told us what they are, or how to deal with them. The standard burner ought to be defined. What is wanted, I imagine, is that the public should get a fixed standard of quality, and then you could ascertain it by using a fixed and uniform standard test. The test-burner should be the most useful and the best adapted for its purpose, and the most perfect attainable. I use Sugg's burner in my own house, and with great satisfaction; but I am afraid their expense prevents them being used largely at private houses. I think they cost about 6s. If the consumer burns gas with a bad burner, that is not the company's fault; but if he burns it with a good burner, he makes the best use of the product sent him. As to the times of testing, I think the system enacted by the Acts of 1868 and 1869 a fair one—that the testing should take place during the hours of greatest consumption in the evening, although I have no objection to my gas being tested at any time. Our district is a suburban one, and the greatest period of consumption would be from sunset to about ten or eleven at night. In the City, of course, it is different; I should suppose it would be more in the afternoon.

By Mr. BRASSEY: I believe the majority of our customers do not use a satisfactory burner. It is one of the principal instructions of the inspectors, to give information about the burners, everywhere where they have opportunity, to gas-fitters and consumers also. Unless the burner is a proper burner, you either overburn the gas and do not get half the light you might obtain from it, or underburn it and get a quantity of smoke, with bad burners. Mr. Sugg has done a great deal to put that matter on a right basis. The price charged for the inferior burners, which do not admit of the burning of gas in a satisfactory manner, is from one penny, upwards; common fishtails can be bought at a few shillings a gross.

Examination resumed: The essence of burning gas, to obtain the greatest amount of light from the smallest quantity of gas, is to burn it without any pressure at all at the point of ignition; just as the gases or vapours that are produced from an oil lamp. They rise with the wick, and without any pressure whatever; and if we can burn gas under those conditions, we get the maximum light. In order to get the gas to the point of ignition, some pressure is necessary from the works. The limit proposed to be put in this bill is, I think, 8-10ths; it is clause 8. It should balance, from midnight to sunset, a column of water not less than 6-10ths of an inch in height; and from sunset to midnight, a column of water not less than one inch in height. I have no objection whatever to make to that; it is perfectly fair. At the present moment, the conditions under which the gas companies are manufacturing gas are more unfavourable than they were in 1869. Coal is about 3s. a ton dearer than it was then. No very great improvement has been made in gas manufacture which would tend to cheapen the cost; but while coal costs us 3s. a ton more than it did in 1869, the value of tar has increased so much that they give us 2s. per ton more for it than they did in that year, so that it practically works out a difference of 1s. The ammoniacal liquor is not included in the tar; that is an independent thing. There has not been any great increase in the price of it within the last five years. The ammoniacal liquor depends upon the price of sulphate of ammonia, which is of a fluctuating character. I have known it at £14 a ton, and I have known it at £10 a ton, and also at £18 and £22 a ton. It is used chiefly as a chemical manure, and is going down now. Ammonia has been fetching its value for 10 years; tar was almost a drug in the market five years ago, when it fetched 1d. a gallon; now we can get 3½d. a gallon. Coke is the most important residual of gas.

By the CHAIRMAN: The way in which the price of coke affects the cost of gas is that we pay so much for our coal and get back so much by the sale of coke, thus diminishing the actual net cost of the coal. Coke is largely used in London for domestic purposes amongst the poor, and also for steam-boilers. In 1871 the average price obtained by us was 8s. 5d. per chaldron. In 1872, when coal began to rise in price, we realized 11s. 2d. per chaldron for coke; in 1873 we realized 18s. 8d. per chaldron; and in 1874 the price went down again to 11s. 2d. During the worst year of coal we paid 10s. a ton more than we did in 1871, and coke realized just exactly 10s. a chaldron more.

By Mr. PHILBRICK: A chaldron being two-thirds of a ton, for every extra £100 paid for coal we received back £70 for our coke.

By the CHAIRMAN: Taking the original price of coke at 8s., the increase in 1873 to 18s. was more in proportion than the increase of coal from 14s. to 24s.; therefore what we lost in the additional price of coal was to some extent made up by the great increase in the price of coke.

By Mr. PHILBRICK: Supposing we paid £100 for a certain quantity of coal in 1871, and for our coke we received £50, that left us with a net cost of £50 for the coal. Supposing in 1873 we paid £200 for the coal, and obtained £125 for the coke, that left us a net cost of £75 for the coal.

By the CHAIRMAN: I ought also to say that a ton of coal produces a chaldron of coke, but we use 30 per cent. of our coke for fuel; so that from every 100 tons of coal, though we produce 100 chaldrons of coke, we have only 70 chaldrons for sale. Besides coke, gas tar, and ammoniacal liquor, we sell nothing but old materials. Each ton of coal produces 10 gallons of tar, and about 21 gallons of ammoniacal liquor of 10 oz. strength.

Mr. VENABLES said he did not propose for the associated companies—the Imperial, Phœnix, London, South Metropolitan, Surrey Consumers, and Independent—to go into the question of clauses.

Cross-examined by Mr. VENABLES: The net cost of coal in 1873, after deducting all the residuals, according to Mr. Field's book, was 8s. 5·29d., and in 1869, 7s. 2·47d., a rise of 1s. 3d. I think the price of coke in 1873 rose in greater proportion than the price of coal, because we had, to some extent, the benefit of the coal at the prices of 1872. In 1874 the result to us, although the price of coal had fallen, was more unfavourable, because coke had fallen from 18s. 8d. to 11s. 2d., and coal only from 24s. 10s. to 20s. 7d. The coke represents the market price; but the low price last year was an exceptional circumstance. It was owing to the idea of the companies, that by storing their coke in the winter they would be able to sell it at a much higher price in the summer. They stored immense quantities in the winter of 1873, and they were not able to sell it in 1874, except at very low rates. In the case of the large companies,

I believe the cement makers take a great quantity of coke; our company sell it to any one who comes. The Chartered Company have suffered very much by being driven to Beckton. I should say ours was a particularly favourable district for selling coke.

By the CHAIRMAN: We get a slightly increased price over the companies generally—perhaps 1s. a chaldron.

Cross-examination resumed: The companies must sell their coke for whatever they can get; it is their best policy to do so. I have been in business for 25 years, and I have only known one single occasion on which it has answered to store coke. In 1874 the production of gas cost us rather over 3s. 2d.; therefore that 2d., and something over, was lost to us; but we still kept some reserve-fund.

Mr. VENABLES: If it had been exhausted, you would have had to reduce your dividend, or raise your price?

Witness: We should have dipped into the reserve-fund.

Mr. VENABLES: But your reserve-fund cannot be replaced when it is once exhausted?

Witness: That £20,000 can be, as I read the Act, certainly.

Mr. CRIPPS: The Act of Parliament is very clear when it is explained. (To witness:) Do you assume that you can recoup that fund, and that still it shall remain a fund to which you can resort for making up your dividends?

Witness: I do.

Mr. CRIPPS: Then I think you are wrong about the Act of Parliament; there is no question, up to a certain point, that you can recoup it.

Cross-examination resumed: My evidence last year before the commissioners was entirely about the details of the cost of manufacture, and things of that kind. The commissioners, therefore, appear to have gone into that question.

Mr. VENABLES: Did you not put it rather too broadly when you said that there was no protection whatever for the consumers. Supposing it appeared from your evidence, and that of other competent witnesses, that the gas had been manufactured in an extravagant and wasteful way, would not the commissioners have been in a position to refuse the increase which was asked?

Witness: I do not think they felt themselves in such a position; they could not take the prices of coal paid by my company as the basis on which to calculate the price for the Chartered or Imperial Companies. I gave evidence on a good many other points affecting the cost of manufacture, besides the price of the coal. I am aware the commissioners exercised their power, in one or two cases, of refusing a part of the increase that was asked for; but they calculated on the estimates of the companies themselves, which, I think, they felt themselves bound to do. I do not judge anybody's motives, but I judge from what I saw, and I am sure the commissioners had their hands so completely tied by the Act of Parliament that they were helpless as to revision.

Mr. VENABLES: The only point in which it appears their hands were tied was in entering into the question of capital. They never expressed a doubt whether they were entitled to go into the question of due care and management in the manufacture?

Witness: I do not like to go into the thing so pointedly, but there is one striking case, I will not say in what year or what company. The company I refer to made their contract for coal in February, when coal was at an exceedingly high price. That contract was to begin in October and end in September of the following year; therefore, in that following year they were paying during nine months for coal at the high price of February in the previous year. The commissioners were obliged to take that contract as having been made in good faith; but I do not believe that if those gentlemen who made the contract had been large manufacturers, they would have acted as they did, and have contracted nine months before they wanted the coal.

Mr. VENABLES: There was one case in which the commissioners refused a part of the increase asked, on an exactly similar ground to that which you have just described—that they thought the contract improvidently entered into?

Witness: They refused it on the ground that they believed coal for the remainder of the year could be purchased at a lower rate than the company estimated it at.

Mr. VENABLES: Will you tell me what reasons have induced you and your company to give so satisfactory a result upon that price of 3s. for 14-candle gas?

Witness: We had the lead of the London gas companies as to price, and we meant to keep it; that is the only reason. I do not know that we have any interest in keeping a lower rate. We have a district of our own, and the monopoly of it; but there is another reason—the lower the price, the more secure the property and the dividend, I consider. In some items of expenditure we are higher than the other companies. Our low price is to a large extent attributable to buying the coal and selling the products.

Mr. VENABLES: You have been more judicious or more fortunate in that than some of the companies have, but why is it, if you have a motive for doing it, that the other companies have not?

Witness: I do not know that we have any motive at all; we could get our 10 per cent. anyhow, so we have practically no motive whatever. Our works are on the Surrey Canal, in the Old Kent Road. The company acquired that site in 1833. Land was then sold a great deal cheaper than it is now. When my father joined the company in 1839, there was £88,000 capital, and the consumption of coal was not more than 5000 tons in the year; the proportion of capital to coal carbonized was about £19,000. The first £80,000 of our capital may be said to have been absolutely wasted; we were paying small dividends of 1½, 2, 3, 4, and so on, per cent. During the last 10 years of my father's tenure of office we paid a dividend averaging about 6 per cent., and the balance of profit we made was appropriated to restoring the works. In 1850 we had really recovered the loss of the £80,000. We had applied for some years 4 per cent. in that way, which explains, to a great extent, the reason for our capital being so small; but I contend that the capital of my company is as much as it ought to be. To some extent the company may have been wrong, but this capital had been wasted, and, if the shareholders were willing to forego a portion of their dividend, in order to recoup the lost capital, I contend that is a perfectly sound principle. If £80,000 is wasted and spent in works that are now of no use, I contend you are bound to restore the works to that extent out of your revenue, so as to keep your capital representing the actual value of your plant.

Mr. VENABLES: You are aware, are you not, that your company are petitioning against this bill?

Witness: Yes, I am; and I ought to say that I have come here partly at the request of the Metropolitan Board. They asked me if I would adhere to the opinions which I had previously expressed, and I said I would. I am not here as a partisan of the Metropolitan Board, nor as a partisan of the companies. But I should like to say one thing—I am a strong advocate of the sliding scale. I believe that is the only means whereby we may obtain and receive a fair administration of the business; and I should say that it would be better if we could, instead of having the referees, have all the conditions of purity, illuminating power, and testing fixed by the Act definitely and unalterable.

Cross-examined by Serjeant SARGOOD: I am aware that the Chartered Company have accepted the 3s. 9d. imposed by the Act of 1868.

Serjeant SARGOOD: As to revision, you have spoken somewhat strongly, describing it as a proceeding affording no protection to the consumers, and that it is all in favour of the companies. You are acquainted with the Act of 1868, I think, by the 57th clause of which provision is made that if, in "the month of January in that year, or any subsequent year, application is made to the Board of Trade, either by the companies or by the consumers, there may be a revision of price." Of course, if a consumer makes the application, you do not expect that it will be in order to raise the price; and if the company make the application, you would not expect that it would be for the purpose of decreasing the price?

Witness: Certainly not. The company made the application both in 1873 and 1874, the object being to get an increased price.

Serjeant SARGOOD: If those who made the application were not entitled to it, I assume that they ought to have failed; but as they did get it, I assume that the arbitrators at least thought that they were entitled to it.

Witness: I suppose the arbitrators felt that they were obliged to act according to the Act of Parliament.

Serjeant SARGOOD: Do you know that the companies going for the increase of price did ask a figure which, after hearing the case, and hearing, *inter alia*, Mr. Livesey in opposition to it, the commissioners would not grant quite to the extent which they wished, and that you and the consumers together managed to knock it down?

Witness: I know rather too much. I know that the companies put their estimates up to the highest point they could.

Serjeant SARGOOD: No doubt of it; but I want to ask whether you did not know that you and the consumers together succeeded in putting it down?

Witness: Not so much as the companies expected that it would be put down. I did not try to put it down.

Serjeant SARGOOD: Did you try to put it up, or did you try to justify the price that the companies had asked?

Witness: No, I did not do that.

By the CHAIRMAN: The price asked by the Chartered Gas Company last year was 5s. 2d., and they obtained 5s.

Serjeant SARGOOD: Therefore, to the extent of 2d., the consumers knocked off our demand, and to the extent of the difference between 3s. 9d. and 5s. we made a case, rightly or wrongly, and obtained it?

Witness: Yes.

Serjeant SARGOOD: At any rate the revision was a very practical one. Now let me ask you what is there in the revision, or the mode of revision, that you find fault with? Do I understand you to say that due care and management was a thing which the commissioners did not or could not inquire into?

Witness: They might have inquired into it, but they were powerless to act upon that inquiry.

Serjeant SARGOOD: Do you mean to put it absolutely and entirely that due care and management in any branch of the company's works was disregarded, or are you alluding now to the question of capital only?

Witness: I allude to the general management and making of contracts.

Serjeant SARGOOD: As you so astounded me in saying that, I will remind you of what they did. Your notion is that they entirely abandoned any idea of jurisdiction over due care and management. This is the 33rd paragraph of their report which they made, explaining their *modus operandi* and their views:—"In the discussions before us, the company were charged with want of due care and management in various particulars, the principal objections made being the following: 1. That their contracts for coal for 1873 were improvident. 2. That their mode of disposing of the coke made at Beckton—namely, by contract for 12 months for the whole quantity made—was improvident. 3. That they had raised an additional share capital in a manner improvident and unfair to the consumers. 4. That they had an excessive amount of unproductive capital. 5. That they did not obtain an adequate quantity of gas from each ton of coal carbonized. 6. That there was too large a proportion of gas made by them wasted by leakage and otherwise." Do you mean to tell this committee that the commissioners not only did not inquire into those facts, but that they said they were powerless to do it?

Witness: They did inquire into all those facts.

Serjeant SARGOOD: I will remind you of what they said in the last paragraph but one:—"The companies defended themselves against these several objections with more or less success," but you see, always with "success," though more or less, and I will tell you why I say that, because, if we had not defended ourselves with success, either greater or smaller, upon every point, they might have mulcted us upon one point or another; and they wound up by saying this:—"But we had not thought ourselves justified in disallowing, on account of any of these objections, any part of the charge for share or loan capital for 1873, or of the estimated expenditure of 1873, which we conceive is the only way in which the conclusion of the absence of due care and management in the past could be applied." What do you say to that?

Witness: I say it proves the powerlessness of the commissioners.

Serjeant SARGOOD: Would it not have been a very unjust exercise of power if, in the face of their own opinion that we had succeeded in removing the obloquy of those miscellaneous charges, they had knocked anything off our estimate?

Witness: If I had been a commissioner I should not have allowed them that high price of coal. I have a very great respect for the gentlemen giving the award, but I still say that they were unable, from some cause or other, to form an exact and proper estimate, or if they could form an exact estimate they were unable to enforce it.

Serjeant SARGOOD: Why should they go through the affectation of saying that they have had an elaborate inquiry, that they have had many issues raised, that they have judged of them, and that as to some of them they put us down, and as to others they put us up; I want to know why you say that these gentlemen have positively stultified themselves in affecting to make an award, believing at the same time that they had no power to make one?

Witness: They were bound by the terms of the Act of Parliament, and they could not go away from them.

Serjeant SARGOOD: Tell me any terms of the Act they were bound by, which disenabled them to do what you wanted, except the one as to raising an expenditure of capital, which was not within the 68th section; tell me any one thing you wanted to inquire into, and did inquire into, in reference to which the hands or minds of the arbitrators were in the slightest degree embarrassed.

Witness: I did not want to inquire into anything, but I would give this fact in evidence, that they could not make an effective inquiry. Take the large excess of profit that the Chartered Company made last year.

Serjeant SARGOOD: They were not inquiring into that. I object to your giving that as an illustration. Tell me of any existing fact in 1873 or 1874 pertinent to the question as to whether they ought to have the price raised, in reference to which you say they had not full power to inquire; give me any point you like.

Witness: I say those revision clauses, so far as the consumers are concerned, are inoperative for their protection.

Serjeant SARGOOD: I heard you say that, but I do not believe it until you give me a reason to believe it. Tell this committee any one question on which the commissioners had the slightest embarrassment as to fully inquiring and fully exercising their judgment, and fully declaring it by their award.

Witness: I know they had not the power.

Serjeant SARGOOD: Tell me any one point.

Witness: I cannot tell you.

Serjeant SARGOOD: Why not; you do not seem to appreciate that you are throwing a great slur upon the gentlemen who have affected to discharge a duty which they were conscientiously called upon to discharge. Tell me any point with reference to the question of due care and management (I give you the whole range of the course of manufacture) as to which they had not the power to inquire, or hesitated to inquire, or hesitated to express an opinion upon when they had inquired.

Witness: I will say this, that those three gentlemen (and there is no one respects them more highly than I do) were not competent to inquire into the

question of due care and management, because not one of them had ever had the management of a gas company.

Serjeant SARGOOD: Then do you think the committee as a body (I would not be impertinent enough to individualize them) better competent to judge this question than those three commissioners?

Witness: That has nothing to do with the question.

Serjeant SARGOOD: This committee has nothing to do with it?

Witness: No.

Serjeant SARGOOD: Then I do not know why they are so busy about it.

Witness: They have nothing to do with the revision of the price of the companies.

Serjeant SARGOOD: But they have to do with this, whether the means exist to enable a statutory tribunal to exercise a proper judgment upon the question of due care and management. You have just said that because the Revision Commissioners were not gas directors, they are the wrong men in the right place; would you have made Revision Commissioners of the gas directors, or should it have been Mr. Livesey and Company?

Witness: No, I would not have had anything to do with it. I should not have liked to have had to adjudicate in any way with that Act of Parliament, because it ties the commissioners up in this direction—as the company gave in an estimate, they were unable to examine that estimate upon the basis of the figures laid before them, and not being able to upset the estimate in one sense, they were obliged to give a price that would give a full dividend.

Serjeant SARGOOD: Supposing they had put down an estimate that coals for the anticipated year would have cost £10,000, and that we had produced those parties who had given us contracts to prove a certain part, and had called experts in the trade to prove the probable estimate of the price of the remainder, there would only have been one way of upsetting it, either to show that the contractors were telling a lie, or that the other men had no judgment in their trade, and knew nothing about it. Do you not know that those two things were done—that we actually produced our contracts to show how much we were safe to expend for a portion of the coal, and we called experts in the trade to prove what we were likely to pay for the remainder?

Witness: That remainder was simply an estimate, and that is why I find fault with the legislation, and I want an alteration of the system, whereby it should be the interest of the companies.

Serjeant SARGOOD: Do not talk about those platitudes. I want you as a practical man to tell this: If the price is to be arranged prospectively, it can only be done upon due estimate of what the expense is to be prospectively?

Witness: Yes.

Serjeant SARGOOD: I will meet you upon your coal contracts; that expense is proved by the fact that we have made contracts, providently or improvidently, by which we are bound; and as to the remainder of the coals we have not contracted for, we must make the best estimate we can of the cost. You know that we called the contracting parties, and put in the contracts; do you mean that they were dishonest contracts?

Witness: No. The commissioners had to assume that the Chartered Company had acted to the best of their judgment in making the contracts.

Serjeant SARGOOD: Then they acquitted them of your challenge, that they had made an improvident contract?

Witness: I do not think so.

Serjeant SARGOOD: Were not they men of sufficient ability to judge of the facts?

Witness: Yes, they were, quite.

Serjeant SARGOOD: As to the estimates, did not we call experts in the trade to prove the reasonable expectation of the price as to the part we had not contracted for, and were not you and your friends capable of impeaching us, by calling other men who would prove that we should get coals for much less?

Witness: Yes, I suppose the other side were. I know that both sides were heard upon that very question, and that I was asked myself. I also know the commissioners assented to it.

Serjeant SARGOOD: Were they competent to form an opinion?

Witness: Yes.

Serjeant SARGOOD: Did they fix the price after forming an opinion?

Witness: Yes, they fixed the price in accordance with the limitations of the Act.

Serjeant SARGOOD: What more do you want than that they should judge of the probable price by hearing evidence on both sides? What has the Act of Parliament to do with the exercise of the commissioners judgment, and the award they made after hearing evidence on both sides; why did that embarrass them?

Witness: I cannot answer the question put in that way.

Serjeant SARGOOD: I do not believe you can, nor any human being. Let me ask you a question upon another subject; the 3s. 9d. price is binding upon us, and you are satisfied to leave it alone?

Witness: Yes.

Serjeant SARGOOD: You know that in 1868 we accepted the price, which was a reduction of what we had previously an opportunity of charging. Do you know that we accepted it at the same time and in the same bill that gave us, and also gave the consumers, the power of revising it, in case of things going up or down adversely to either side?

Witness: Yes, and it was thought fair at the time.

Serjeant SARGOOD: The same Act of Parliament said that the revisers should always bear in mind that the price was to be fixed so as to enable us to earn our 10 per cent., but not more. Allow me to ask you, as a gas man, whether you know that we have raised a million of capital on the basis of that arrangement—with a 10 per cent. dividend? If so, do you think it fair now to alter the 1868 bill, and say, "You shall no longer have a fixed price, to be revised by an independent arbitrator, in order to secure that advantage to you, or a fixed price to be revised by an independent arbitrator to secure the advantage to the public;" but that we should be put upon a sliding scale, and that if ever the price shift upwards, our dividends shall go downwards—is that a fair thing after our bargain made in 1868?

Witness: You have given me a very long question, but I will give my own answer. I say Parliament has given to the gas companies those revision clauses; they are a certain and decided advantage to the gas companies, and Parliament has now no right to take from them what they have given them, without giving to us a fair equivalent.

Serjeant SARGOOD: "Us;" they have not given it to you, have they?

Witness: We have a revision clause, but we do not mean to use it. I contend that we, the South Metropolitan, have revision clauses which are worth something to us; and as far as I am concerned, I should say I will not give up a certain advantage unless you give me an equivalent for it; or I will not allow you to take it from me without my consent.

Serjeant SARGOOD: Comparisons are odious, but they are worth more to us than to you; you are a 14-candle man, and we are 16-candles, but both at 3s. 9d.?

Witness: Yes.

Serjeant SARGOOD: Taking the Act altogether—the 10 per cent., the fixed price, the revision, subject to keeping up the 10 per cent., the raising of our capital, and the five amalgamations—do you think it can honestly be proposed by the consumers to come and change the whole foundation of the arrangement we accepted in 1868, and have acted upon to this hour?

Witness: Not without your consent, and giving you an equivalent.

Re-examined by Mr. CRIPPS: Under the Act of 1860 there was no restriction upon the amount the companies could charge, so long as it did not exceed 5s. 6d. The companies who applied for revision had to prove their case by their own officers and engineers. It is a fact that all the principal gas engineers who could be resorted to for a matter of opinion in the metropolis are persons engaged, in some way or other, by the gas companies. I know the officers of the companies well, and I believe them to be thoroughly honest men; but I do not believe, prejudiced as they are, they can act quite impartially. Before the commissioners the companies had to support the propriety of certain contracts they had made, giving prices for coal which were alleged to be too high; and, in support of that, they called those dealers in coal, who said they had not received a farthing too much for the coal they had sold. It was not very likely that those dealers would come and say that a contract had been made unfair to the public, and too much to their own advantage; but the dealers were fair and honourable men, so far as I knew them.

Serjeant SARGOOD: We did not call the coal contractors, but the heads of the trade—not parties capable of contracting with us.

Mr. CRIPPS: Whether they were or not, they were persons who were coal-dealers, and would get the greatest price they could for their coal.

Re-examination continued: As to the coke, they had to prove that they had not sold their coke at too small a price, and, to prove that, they called the coke-dealers, who said they gave quite enough for the coke.

Mr. CRIPPS: One would not expect, under those circumstances, that it would be quite a fair question of evidence between those finding fault with the companies and those supporting the particular case?

Witness: It was a very difficult position.

Mr. CRIPPS: The commissioners did apply for legal authority to know whether they had not the larger power which we contended for, as against the smaller power which the companies contended for?

Witness: They took, I believe, the opinion of the law officers of the Crown upon the question of their entering into the subject of capital.

Mr. CRIPPS: What could have been the object of the commissioners in desiring to have a legal opinion as to the extent of their power?

Serjeant SARGOOD: I object to my learned friend asking what passed in the minds of the commissioners, and their object in getting a legal opinion.

The CHAIRMAN: I do not say that you have not the right to ask that question, but it is hardly worth putting it.

Mr. CRIPPS: The result was that the commissioners did not go into the facts which we, on behalf of the Metropolitan Board, desired they should go into?

Witness: They did not touch the question of capital.

The CHAIRMAN: Their appeal to the law officers as to whether they had or not the authority to judge of a question of capital, was in relation to the Imperial Gas Company, and it did not affect the question of the Chartered Gas Company?

Witness: The Imperial inquiry came on first, and, having had that question of capital settled in the case of the Imperial, it was not raised in the case of the Chartered.

Mr. CRIPPS: That question was not raised in 1873, when the Chartered Company were before the commissioners; it was raised in 1874, when the Chartered and the Imperial were both before the commissioners. (To witness:) In the report of the commissioners in 1873, after mentioning what were the objections made to the company, they say: "We have not thought ourselves justifying in disallowing, on account of any of these objections, any part of the charge for share or loan capital for 1873, or of the estimated expenditure of 1873, which we conceive is the only way in which the conclusion of the absence of due care and management in the past could be applied." Therefore, all due care and management in the past was excluded from the subject of that inquiry.

Serjeant SARGOOD: I beg your pardon; that is a *non sequitur*. You have no right to put it to the witness.

Witness: I quite agree with them; the management expenses are done with for the year that is past.

Mr. CRIPPS: You were pressed very much by my learned friend as to what it is to which you attribute the low price at which you, the South Metropolitan, are supplying gas to the metropolis. I see that your net cost of coal is much the same as the Phœnix, and the Surrey Consumers, and the Ratcliff, though it is less than The Gaslight, the Imperial, the Commercial, and the Independent?

Witness: It is more than the Ratcliff, but not much.

Mr. CRIPPS: Who arranges the purchase of coals on behalf of the South Metropolitan Company?

Witness: I suppose I may say I do entirely. My contracts are submitted to the directors, but, during the last three or four years, every suggestion I have made about coals has been adopted by the directors. I am in a favourable position, holding a double office in the company. I am not only able to regulate the purchase of coal, but also to know what is wanted, and what is used. The directors in many other companies have to receive reports from the men as to what they want, and then request their secretary to apply for tenders, and so there is divided responsibility, and divided action too. My whole time is devoted to the matter, and I am happy to say that my directors treat me with the fullest confidence in everything, and do not practically interfere with me. My opinion is, that a gas company should be managed by a general manager, who should have almost the entire control, and the work of the directors should be to find a suitable man, and trust him, the direction merely remaining a board of consultation. I heard the chairman of the Chartered Company before the commissioners repudiate the idea of a gentleman like himself going upon the Coal Exchange, and I think he was right. I do not think it was part of his duty to do it. As to the price of coke, the gas companies obtained an advantage in the rise of coke in the early days of the high price of coal, and they lost it to some extent when the coal began to go down.

By the CHAIRMAN: I am certainly not in favour of the 6th clause as it stood, nor yet as it stands amended.

The CHAIRMAN: The addition of 48A and 48B does not remove the objection in your mind to the clause?

Witness: The addition you refer to is in reference to allowing the companies to form a reserve-fund, my objection to which is that I conceive it would be to the interest of the gas companies to keep the price as near as possible to 3s. 9d. Having got their reserve-fund by reducing the price to some extent, they would have no further inducement to reduce. My objection to clause 6 as it originally stood was, that it was entirely unfair; that if we are to submit to a reduction of dividend if our price goes up, we ought in common fairness to have an increase of dividend if our price goes down. There is no difference in principle between what I recommended and the recommendation contained in the Board of Trade's letter. We are increasing our capital a little every year. I am endeavouring so to arrange it that the increased business pays a dividend on the increased capital. The proportion of our capital per ton of coal is £4 11s. 6d., which is very considerably less than that of any other company, with the exception of the Independent. The Commercial is £5 1s. 6d. The Gaslight £7 14s. 11d., and the Imperial £7 8s. 4d.

The CHAIRMAN: Comparing your company with, say, The Gaslight Company, what is the reason of this great difference?

Witness: The Gaslight and Coke Company have had to expend a very large amount on capital account in the construction of the Beckton works. They were forced to go to Beckton, because the local authorities would not allow them to erect works nearer London; and in that undertaking, purchasing land and making a jetty for unloading steamers, largely adds to the capital, and does not become fully productive for some years after it is invested.

The CHAIRMAN: I suppose they have never adopted the policy you did up to 1850, of increasing the capital by allotting part of the dividend?

Witness: I do not know whether they ever did that; but, taking the average of the capitals of the companies in 1863, I find the proportion was £5 2s. 3d. per ton of coals used in that year. I estimate that that comes rather under the mark. The proportion is something over £7, so that in 1863 the capitals of all the companies were at a very moderate amount indeed. The Imperial have built very large works at Bromley-by-Bow, and that capital is not all productive yet. It is a very difficult question to judge of what other men have done; but I am bound to say that I should have been very sorry to have spent so much money as those two large companies have done on their works.

The CHAIRMAN: I find your total working expenses are put down at 14·68d per 1000 feet sold, and the next lowest to that is the Imperial, which is 15·91d, the Chartered being 17·78d. I believe a considerable part of the expense is in the expense of distributing, is it not?

Witness: Yes, it is. Compared with the Imperial, I should say that the district of the South Metropolitan is almost exactly of the same character, and that the cost of distribution ought to be the same per 1000 in both cases. The Chartered Company have the richest district in the world; they have the largest consumption of gas for the smallest area. I really do not know why either the Imperial or the Chartered Company should not have made gas as cheaply as the South Metropolitan; they ought to have bought their coals, if all the theories of trade are right, at a lower rate than we did. A large customer ought to be able to buy cheaper than a small one.

Mr. BIRLEY: Do not you think, if it were confided to you as a mission to ascertain whether any of the other companies were exercising due care and management, you could, under the power the Act of Parliament gives, make a report?

Witness: I do not say that I could not make a report, but I contend that the Act of Parliament would so limit my action that, practically, it would be of no use. I am aware that the commissioners have the fullest power of inquiry; but it must be a very glaring case indeed for them to put their fingers upon it and say, "There is a gross case of bad management, and we must deal with it," even if they were thorough experts in the trade.

The CHAIRMAN: Taking, for instance, a contract for coal, do you think if a contract had been made in good faith, and if it was not above the market price of the day in which it was made, that the commissioners could complain that they had shown a want of due care and management because there had been a mistake made at the time of buying it?

Witness: I do not think the commissioners could refuse to allow on that ground.

The CHAIRMAN: I understood you to say that you thought these large companies might have got through the coal famine as well as you did if they had bought their coal better; but I find in 1873 you paid 24s. 10·37d. for coal, and the Imperial Company paid 24s. 1·45d.?

Witness: I can explain that. The policy pursued by my company has been to get coal as far as possible at the current rates, and not to make large contracts in advance. In 1873 we paid the full price of that year for coal. The Imperial had the largest quantity of coal they used in 1873 contracted for in 1872 at lower rates; then in 1874 we got the best of it. In 1872 the South Metropolitan coal was 16s. 7d., the Imperial 17s. 2½d., and The Gaslight and Coke Company 18s. 2½d.

Mr. MICHAEL: And the Phœnix 16s. 3d.

The CHAIRMAN: But certainly this information would appear to imply that it could not be by the bad purchases in coal solely, or indeed mainly, that you got through the coal famine without charging a higher price to your customers, and yet keeping your dividend?

Witness: It costs us 6d. less to pay our dividend than it does the larger companies, because we have a less proportion of capital. I might explain further about that coal; some of the companies had contracts running for three or four years, and those contracts did not terminate till 1873; so that they got coal in 1873 at the prices of 1871; now, in 1874, I have my own calculations, and we get the best of it again.

By Mr. VENABLES: The Phœnix was 22s. in 1873, but they had an old standing contract.

Serjeant SARGOOD: Will you take for the Chartered Company this observation, that on page 1 of Mr. Field's book you will find that in 1872 our per centage of cannel was 22, and in 1873 it was 33 of the gas sold.

Witness: I admit that fact, and also that cannel is much more expensive than the other coal; but when the companies sold their gas, they got a proportionate price for it.

The CHAIRMAN: I do not feel that we have got quite to the meaning of the remarkable fact that you have given us. We will take the Chartered Company, who applied to the commissioners for an increase from 3s. 9d. to 5s. 2d., and obtained 5s., for 16-candle gas. You found it was not necessary for you to make any application whatever, and were able to go on selling at 3s. with 14 candles, and only at the expense of having to make a comparatively small deduction from your surplus. I cannot see that the price of coal explains that.

Witness: In the first place, it cost us say 3s. 2d.; if we had had as high a proportionate capital as the Chartered, we should have had to charge 6d. more to cover it—say 3s. 8d. Then as to the quality of the gas, theirs being two candles nominally higher than ours, I put another 3d. on for that, and that brings it to 3s. 11d. Then their unaccounted-for gas was nearly double ours; while we, during the last five years, have accounted for 95 per cent. of our gas, the Chartered Company have only accounted for about 86 per cent., owing to the great extent of amalgamations, and their taking over a large quantity of old and useless mains. They are now fast reducing their leakage. The Imperial did not apply for any increase in 1873; but in 1874 they obtained 11d., making a charge of 4s. 8d.; and furnishing the same gas as our company. Amalgamation does not account for that with the Imperial Company, but there is another 6d. there for dividend, which brings it up to 3s. 8d. Their leakage is heavier than ours, and they do not gain so much by their residuals as we do, and we sold tar better than they did in that year. We have power to increase our capital another £100,000, making £500,000, and the shares are allotted and already issued for it.

The CHAIRMAN: Does not it sometimes come before your company as a question of merely looking after the interests of the shareholders, that it would be desirable to increase the capital, and therefore the shareholders would have more of their money invested at 10 per cent.

Witness: That is the point; it is a direct inducement for the companies to pile up the capital; it is a direct inducement for my company, and it is my interest too.

By Mr. BIRLEY: The Chartered laid a statement before the commissioners, in which it was shown that the coal for nine months of the year for which the commissioners were to fix the price was already contracted for, and the commissioners therefore said, "We are bound to believe these gentlemen acted to the best of their judgment, and we must accept that great item for coals." I think none but an expert could say that there had been lavish and unnecessary expenditure which ought to be disallowed. One of the commissioners was an actuary, one was a barrister, and one was a chemist, and there was not one amongst them expert as an engineer. They could have called in experts, but if they had called me in I should not have liked to have said that there had been unnecessary expense. I am friendly with the engineer of the Imperial, and very likely he is right and I am wrong. The commissioners gave great attention to the question of leakage, and they accepted the statements of the Chartered Company, and, I believe, gave the company credit for doing all they possibly could to reduce the leakage. The company did do all that was possible. On the question of production the commissioners found fault with the company for not getting as much as they ought to have done; but seeing that considerable improvements had been made, they assumed the company were doing the best they could. I would also say the same of every manufacturer of gas.

Mr. BRISTOWE: You told us that the Chartered and Imperial Companies have undertaken large works, which at present are unremunerative to some extent. I think in giving your figures you did not add anything on that account?

Witness: No, that is a question of capital; it is entirely independent of the working expenses of making the gas. The extension of their business necessitated their constructing large works, and I must do the Chartered Company the justice to say, that while they have power to raise capital at 10 per cent., they issued their shares at 5 per cent. for five years, on the ground, I believe, that they considered that that capital would not be fully remunerative, and it would not be fair to charge the public with the full 10 per cent. at that time.

Mr. BRISTOWE: Then at the time you compare the prices that you could afford to charge with the charges of those two companies, you had no unproductive capital and they had?

Witness: I think so; our business is extending as rapidly as the Chartered, and we are building new works every year, and gasholders are being built which will not be productive for two years.

The CHAIRMAN: I understood you to say that the Chartered Company issued a good deal of capital for five years to bear 5 per cent. You do not mean that there was any capital that brought no interest at all?

Witness: No; as an instance, they have bought 150 acres of land that they have had to pay for, but only a portion of that land is really productive; it is used for a gas manufacturing station.

The CHAIRMAN: In so far as their money did not earn anything, it would tend to prevent their getting their 10 per cent.?

Witness: Yes; but they raised the price of gas to meet it.

Mr. TALBOT: Did not you tell the committee that the contracts of some of the companies were made in the beginning of 1873, which were only to take effect in the autumn of that year? Were those contracts taken when prices were very high?

Witness: In my experience, the highest price that coal reached was in the months of February and March, 1873. One of them made a contract in those months, the deliveries to begin in October, 1873, and to end in September, 1874. I believe that company did it to the best of their judgment. They were afraid they would not get the coal at all unless they closed at that time, and the commissioners assumed that the company had acted to the best of their judgment.

Mr. TALBOT: Can you suggest any better way of checking improvident contracts than this?

Witness: I cannot suggest any worse way. I do not think there is any way by which an external authority can interfere with gentlemen making contracts to the best of their judgment at the time.

Mr. TALBOT: Supposing you could pass an Act of Parliament yourself, how would you suggest that this thing should be better arranged for the future?

Witness: The suggestion I have already made, that the dividend should be dependent upon the price charged for the gas; then there would be no need for commissioners or for any inquiry whatever, but the auditor would have to certify the price charged.

By Mr. BRASSEY: If my scheme were adopted, it would undoubtedly be necessary to have somebody to represent the consumers, to test the quality of the gas. The same inspection would be necessary as to quality as is in operation with the Chartered and Imperial and ourselves.

Mr. BRASSEY: You have been asked questions as to contracts for coal as bearing upon the cost of the production of gas. Are there not a great many other details which must be carefully managed, in order to secure economical production of gas—such, for instance, as care in the management, the labour employed, care and skill in the arrangement of the works and plant and buildings, judicious arrangement in regard to the handling of large quantities of coal, and so forth?

Witness: All those details have a very material effect upon the price.

Mr. TALBOT: Can anybody be a competent judge of the details who has not been practically employed as a manager of gas-works?

Witness: I should say certainly not. The manufacture of gas being more or less a monopoly, the number of persons who have a practical acquaintance with the details of the operations is limited. I can hardly point to a single gas engineer who has had large experience with large works, who is free and independent of the companies; therefore, when the commissioners are asked to go into these details, not being themselves practically conversant with the manufacture of gas, it is very difficult for them to obtain the necessary advice.

By Serjeant SARGOOD: I am aware that Mr. Stevenson, who has had large experience as a gas engineer, was examined before the commissioners, and has been examined before every committee on behalf of the consumers.

The CHAIRMAN: Part of the working expenses, I suppose, is the wear and tear of the plant.

Witness: Yes; in our case last year the wear and tear of plant, and renewal of it, cost between £5000 and £6000; it is not a very considerable item. It is the regular custom to put it to revenue account.

Mr. BRASSEY: Has your experience, as a man of business, been sufficiently wide to enable you to say, of your own knowledge, that there is a general tendency among managers of large companies to increase the establishment, and increase the works, and make proposals for expenditure of capital?

Witness: It is rather difficult to answer that question. Some engineers in this room are most sincerely anxious to reduce their expenditure to the lowest possible point. The engineers of the works supplying the districts adjoining my own are working, I believe, more economically than I am myself; they would be glad to see their price reduced to something approaching our standard.

Mr. BRASSEY: So that there is an emulation among your profession to produce gas cheaply?

Witness: Yes; but some of them say we do not care anything about the public or the price either.

(To be continued.)

TUESDAY, APRIL 27.

(Before Mr. A. W. PEEL, *Chairman; Mr.* RANDALL PLUNKETT, *Mr.* HOLMS, *and Captain* POLHILL-TURNER.)

STOCKTON AND MIDDLESBROUGH WATER BILL.

(Continued from page 842.)

Mr. *Hawksley* recalled, and further cross-examined by Mr. BROWNE, said the minimum yield per 1000 acres at the inlet was 4-10ths of a cubic foot per second. The capacity of the depositing-ponds was 7,276,953 gallons. These were not storeage reservoirs in any sense. The time they could refrain from taking water from the river, if it were unsuitable to be taken, would depend upon the reservoirs at Fighting Cocks, which held about 20 million gallons. The area of the filtering-beds was 9072 square yards. [Witness described by drawings the nature of the filtering arrangements.] There were eight filtering-beds, but never more than one in operation at a time. In the new works the water would pass through the filter-beds at the rate, ultimately, of about 6 inches per hour; but, as they would be extensive enough to meet future requirements, it might be that, for the present, they would only filter at the rate of 2 inches. It was a fact that the company would not allow people to do their own work with regard to the meters, and that the company's plumbers must do it. He hoped that would never be altered. They were not charging the maximum water-rents at Middlesbrough; for instance, a house of £5 per year they charged 7s. instead of 7s. 6d. He could not say whether there was a

single house in Middlesbrough which was charged less than 12s. a year, but they did not exceed the Act of Parliament. He was in favour of filtering by magnetic carbide, but only for house purposes. It would not take all the sewage out of water, unless there was a large quantity of water subjected to oxidation. Above Doncaster there were 500,000 people, and the water which came down to Doncaster was not fit to drink, but it was drunk. Sheffield was the largest town on the Don above. The pumps at Tees Cottage were double acting. Gravitation works, with storeage reservoirs, would often cost as much as £120,000 per million gallons, and some very much more. At Normanton it cost more, but it was not a fact that at Leeds it only cost £25,000 per million gallons, nor was it so at Dublin, where the cost was enormously more. They had not to pay a farthing in Dublin for taking the water out of the river, except under the Water-Works Clauses Act, nor had they to pay £40,000 to the landowners; but they had an accident, and, in consequence of damage to a house by flooding, a gentleman got £12,000. In Manchester an opposition had to be bought off for £70,000, but that was because the corporation had over-estimated the rainfall, and the millowners got one-third of the water for compensation; the corporation afterwards bought up those excessive rights, in order to get sufficient water. In other cases alluded to, the circumstances under which compensation was given differed from those of the present case. At Leeds £12,000 was given, but only under the general Act. The Weardale scheme cost £950,000, and the population to be supplied was about 200,000, but the reservoirs were comparatively near the part where the water had to be distributed. The Middlesbrough Corporation took water for three distinct purposes, and there were three separate meters, which would make a small difference in the price charged. The railway company were charged in bulk, the water being delivered into their tanks. At Doncaster they were constructing new works, in order to leave the Don. Newcastle drew from the Tyne in part, and had some gravitation works besides. They had nine storeage reservoirs, on their own proper drainage grounds, and they held altogether one million gallons. The domestic supply to Middlesbrough (including waste) was 31,358,915 gallons, and the population supplied was about 120,000.

Re-examined by Mr. SOMERSET: In calculating what was required for a town, it was put down at so many gallons per head, which included the domestic and all other supply. A storeage reservoir was one built across a stream, from which it was supplied at its head, and in which accumulated the floods of a stream; one-third of this was given as compensation to the river below it, while two-thirds were taken to the place of distribution. The reservoirs at Leeds and other places did not come within that definition, and were not storeage reservoirs. The calculations on the other side had been the cost of the reservoirs alone, and did not include, as his did, the total cost of the distribution of the water. He thought he had heard that at Weardale the lowest price charged would be 6d. per 1000 gallons. The London companies were limited to 100 million gallons per day, but the Stockton companies were limited to 60 million gallons per week. The limitation in the Thames no doubt had reference to the state of the Thames below Teddington Lock, by Richmond. It was no analogy to this case at all. Nor could the Wakefield water be compared with that of the Tees, for it was a dark blue, and writing executed on paper with it had been exhibited in one of the committee-rooms. There were no minerals at the Tees watershed, or they no doubt would have been worked. There was nothing at all poisonous in the water. There was no comparison between a standard for gas and one for water, as the gas was manufactured and the water was not. That made all the difference in the world; and if we went on in this way we should be afraid to live for fear we should die. The water supplied to Stockton and Middlesbrough was exceedingly well filtered, and the opponents were confounding the colour with suspended matter. They did not profess to take out the peat stain, nor did they know how to do so. The report on the London waters by Dr. Frankland showed that the Tees water was very much purer. He reported that the Tees water had no previous sewage contamination, while that of the London water had. At Aberdeen he could not find that there would be any advantage in making impounding reservoirs, and Parliament disregarded the fact of there being some small villages above Balmoral. The compensation given in the Leeds case was what would be given in this case, under the general Act. With reference to Darlington sewage, he believed the corporation had never intended to appeal against the injunction.

By the COMMITTEE: The capacity of the new storeage reservoirs would be:—Sadberge, originally 5 million, would be increased to 10 million; Ormesby would be 5 million; and Normanby 1 million—making a total of 11 million gallons, eventually to be increased to 16 million.

Mr. *F. J. Bramwell*, examined by Mr. LUCK, said he was an engineer and president of the Institution of Mechanical Engineers. He had examined the Tees, except between Dinsdale and Stockton. He had examined the company's works, which he described, and said they were well adapted for the purpose. The proposed works were well calculated to supply the increased population of Stockton and Middlesbrough and the district beyond. Water must either be got from wells, from collection, or from rivers; but the sinking of deep wells had been tried in that district without success. The construction of storeage or impounding reservoirs was the most costly of all; but where there was a river suited to the purpose, that was the best plan, for nature brought it to our doors. It was the cheapest mode of all, probably. The water of the Tees appeared to be thoroughly fit for the purpose; or, if not, that from the Thames was still more unfit. The London supply had been declared fit and proper, and this was better. There did not appear to be any drainage, as a rule, from the up-river villages; but some places did dispose of their sewage in this way. The amount, however, was so small, it was so far from the pumping station, and the channel was of such a nature, that there could be nothing to make the water an impure source of supply. If ever there was a river which was calculated to produce the elimination of sewage, it was the Tees. At Middleton and near Barnard Castle, he examined two streams which appeared to come from mineral works; but what he found was merely triturated rocks, as in a glacier; and the people of Middlesbrough would be more injured by the lead pipes in their houses, than by any which could find its way into the river. The improvements in carrying on lead-works prevented lead being washed away in that manner. He visited Dinsdale, and did not consider the trade of the mill would increase, as it was away from the navigation and the railway. There appeared to be an abundant supply of water, and he was told they were never stopped for want of water, but sometimes floods stopped them. The further powers proposed in this bill would have no effect whatever upon the mill. The proposed works were well adapted for the present and prospective population, both as regarded their intake and quality of water, and as regarded the position of the service reservoirs at Sadberge and other reservoirs they appeared to him to be well laid out, so as to give a copious and certain supply to the persons who depended upon the company for their water.

Cross-examined by Mr. PATERSON: He went no farther than Middleton-in-Teesdale, and did not know what the capability of the district was for storeage reservoirs; but even at the best they were expensive, and might raise the cost of the water to 1s. per 1000 gallons. When at Dinsdale, there was not a considerable flood, and he was not told that the Weir was sometimes dry for weeks together. He was not aware that there was not water enough for the fish to pass, but was told there was enough for the mill. He believed it very improbable that the Weir ever was dry. When he was there, there was water to spare all over the place.

By Mr. STANLEY: He had not considered the effect of the increased supply to be taken at the Tees Cottage upon the fisheries of the river. He thought it absolutely incredible that the Weir should ever be dry. He was not very familiar with the Tees. He went there 35 years ago, when he drove a locomotive from Stockton to Darlington. He would not go to the tidal part of a river to measure the flow of the water above. Nothing was more easy than to measure the weir, where the water was running over. The flow of an exceptionally dry season ought not to be taken, but an average time.

By Mr. BROWN: He had never made a reservoir for gravitation purposes. The Thames water had not always proved satisfactory, when inefficient works were executed by the company. He did not know that Messrs. Bolckow, Vaughan, and Co., while sinking for ore at Skelton, had found a good supply of water; but he had heard that the brine was found in that locality after going down about 1000 feet. He had seen hundreds of fish at the Dinsdale mill-race, and thought it a good proof that the river could not be very bad. That was below the Skerne, with the Darlington sewage in it. He believed it was only Wakefield that put its own sewage in the river and pumped it out again. The water of the Tees appeared to him to contain very little suspended matter.

By Mr. ROBERTS: He was surprised to hear that in dry weather the whole flow of the river ran through the wheel and the fish-pass, and that the river was dry. The mill could not be injured until the quantity of water coming down was less than 18 million gallons per day. That would be the extreme work of the mill, with three pairs of stones. It was usual in Board of Trade Acts to insert clauses for the protection of millowners, where the water was abstracted by impounding reservoirs—the compensation was then given in water. He would not do so in the present case, as he did not believe any harm would be done.

Re-examined by Mr. LITTLER: The 6th clause of the Water-Works Clauses Act was wide enough to meet any compensation to Mr. Surtees, but he could understand that a gentleman might wish to get compensation on a hypothetical state of facts, rather than wait until the damage actually occurred. He did not know where there was any mine on the upper reaches of the Tees, as alleged in one of the petitions. In dressing ore the lead, being heavy, was retained, and the triturated stone was washed into the river in a milky stream. At Dinsdale the fish tried to leap up the weir, instead of using the pass, when there was ample water for both.

Mr. *W. Pole*, examined by Mr. RICHARDS, said he was a civil engineer, residing in Parliament Street, a Fellow of the Royal Society, and a member of the Council of Civil Engineers. He had had large experience, and was secretary of the Royal Commission on Water Supply from 1866 to 1869. He visited the Tees a short time ago, and examined the company's works, which were well designed, as far as they went, and effectively managed. The water he considered to be of good quality, and well filtered. The rate of 3d. per 1000 gallons was unusually low—lower than anything he had heard of. He was well acquainted with the iron trade, and had observed the unprecedented growth of the Middlesbrough district. He had examined the plans of the proposed new works, and visited the sites selected by the company, of which he approved. The general principle laid down was that towns should have their supply of water from the nearest natural source, and this was the best for the Tees district. The waters of the Tees might be secured either by the natural flow of the river, or by forming reservoirs in the higher parts of the district, and conveying the water from them. The storeage reservoir system would largely increase the cost of the water. It was never resorted to, except in cases where the waters of the river were not suitable if obtained lower down. It would be impossible to supply water at the present low rate if expensive reservoirs had to be provided in the upper part of the valley. Middleton-in-Teesdale was about 30 miles above Tees Cottage, and the area between was, in most parts, sparsely inhabited. With the exception of Gainford and Barnard Castle, they were agricultural populations. There was no system of sewerage at Gainford, but there were drains. Some little sewage water flowed into the river from there, but it would all be oxidized before getting to Tees Cottage, as the Tees was a somewhat tumultuous and steep river, so that the sewage of Barnard Castle would also be got rid of before getting down so far as Tees Cottage. The gradient of the river was about 20 feet a mile, which was at one time thought steep even for a railway. It was exceedingly steep for a river; in fact, a river, properly so called, with a smooth-flowing stream, could not exist with such a gradient. It must involve a very rough bed, and a constant tumultuous motion of the water. He agreed that towns should not be allowed to drain into rivers at all, but, taking things as they were, the sewage of Barnard Castle would be dissipated before the water was pumped out at Tees Cottage, partly by fishes and partly by oxidation. He had examined watersheds in Wales and Cumberland proposed for the supply of London, but in the vicinity of lead mines. He found no contamination of mineral matter at all, as the ore was separated. He had no reason to suppose there was any lead contamination in the Tees, for the mines were over 30 miles above the intake. He did not believe that any metallic substance entered the water at all. The discoloration of the water came from the peat, and was as wholesome as it could be. Water with the peat stain was found all over the North of England and Scotland. The abstraction of the water by the company would not affect the stream, as it was such a small proportion. He made a measurement of the stream above the intake on the 3rd of April, and found it was about 70 million gallons a day. He took sections and the surface velocity, and, after making allowances, estimated the mean velocity. He did not know what the weather had been, but the water had every indication of being low. The scour appeared to be produced more by the tidal action and floods than by a dry-weather flow. The proposed scheme was well adapted to serve the purposes of the district. The rules of the company were not more strict than was required to prevent waste, and they were such as had been found to be necessary. The sums paid by the London companies to the conservators of the river were for services rendered, and not in respect of any abstract right; it was for cleaning the river, and not for taking the water.

Cross-examined by Mr. BIDDER: Captain Burstall distinctly stated in his evidence on the East London Water Bill that the amount paid to the Conservators of the Thames was for services rendered. He (witness) was not prepared to say that 70 million gallons was the minimum flow of the Tees. Of course the removal of the contamination of sewage depended on the proportion of sewage to pure water. The proportion of sewage in the Thames to the volume of the river was not less than in the Tees. He could not conceive that the quantity of water would be so small that any offensiveness could occur from want of water owing to the abstraction by the company. He should prefer not having sewage at all in the water, and thought that Barnard Castle and Gainford ought to be prevented from turning their sewage into the river. He could not say whether a storeage system of reservoirs would be more expensive at the head of the Tees than elsewhere. He had not seen the lead "hush" in the Tees, but he had seen it in the Middleton Brook, or, as he called it, "comminuted matrix." It was not particularly thick at that time. If the water was thick with it, it would not much matter, as it would be deposited in the reservoirs, or would be filtered out if any remained.

WEDNESDAY, APRIL 28.

Mr. *Pole*, recalled and cross-examined by Mr. PATERSON, said he visited the Tees on the 1st, 2nd, and 3rd of April. At the time he examined the river he found the flow was 127 cubic feet per second, which would give 70 million gallons per day. According to this formula, that would be rather less, than over the actual figure. At a rough calculation, he found the water coming over Dinsdale Dam to be about 80 million gallons per day. He was accustomed to measuring running water. It was only a rough estimate. He was certain about his estimate at Tees Cottage, but not so certain about that at the weir.

He had made no calculation as to the cost of storeage reservoirs for this district, and could neither corroborate nor differ from Mr. Hawksley's estimate.

By Mr. STANLEY: His object in going up the river was to see the drainage area and the sewage. He was told that Barnard Castle got its water supply from Bowes, and not from the Tees. There was a good reason for that, as they did not require to pump it; but the water was not better than the Tees. He did not hear that it was in consequence of an outbreak of cholera and fever that they abandoned the Tees water.

Mr. RICHARDS said there had been no proof given of any outbreak of cholera or fever.

Witness said that if he had been told that the attack was due to the use of the Tees water, he should not have believed it. He saw no signs of a discharge of sewage; but he saw a stream at Middleton which came from the lead mines. He did not know whether it was during the washing process; but his impression was that the washing was continuous. The "hush" could not get down to Stockton or Middlesbrough, as it would be stopped in the subsiding reservoirs, and if it escaped them it would be eliminated in the filters. He had not examined the river from Stockton Stone Bridge to Yarm, but it did not necessarily follow that salt water came up with the tide. It dammed back the fresh water, so that there was fresh water a long way up the river within the ebb and flow.

By Mr. BROWNE: The settling reservoir had nothing to do with the supply of the town. If the river was in such bad condition that it would not deposit properly, it might be right to stop taking any of it; but that was not the case here. Having only one day's supply in the subsiding reservoir had nothing at all to do with its size. The rates charged were unusually low, but he was referring to those for trade purposes only, and did not know what the charges were for domestic consumption. If the water were charged 7½d per 1000 gallons to the iron-works, he could not say how much per ton that would add to the price of pig iron; but it would certainly diminish the profits of the ironmasters. So far as he knew, filtration would not remove the peat stain from the water. He should say that the 70 million gallons was a dry-weather flow. It probably would be lower in times of a long drought.

Re-examined by Mr. RICHARDS: The fact of the river being only 15 inches deep showed that it must have been low at the time. He was not a constructor of water-works, but had large experience with regard to them, and his calculation was certainly rather against the stream than in its favour. At Thames Ditton the filtering-beds were found not to be sufficient by Mr. Simpson, the engineer of the Lambeth Water Company, and subsiding reservoirs were added, and they have been adopted by all the other companies since. The effect of them was to relieve the filters. The subsiding reservoir was a matter of economy in construction. In the present case, the higher the company went up the Tees the nearer would they be to the source of contamination, as the lead mines were principally at Hough beck, which fell into the Tees at Middleton, 30 miles up the river.

This completed the case for the promoters.

Mr. VENABLES, for the Stockton Corporation, then addressed the committee, saying that his clients objected, in the first place, to the quality of the water. They objected to the water being taken for domestic consumption after receiving sewage, and evidence would be given on that point by some of the other opponents. One strong argument against the bill was the numbers and strength of the opposition. The promoters were here to show that they satisfactorily supplied the district as to quality, and that they required a further quantity; but although the inhabitants of the towns and other persons in the neighbourhood were largely interested, the promoters could not get any public body to support them On the contrary, every public body in the district was opposing them. Nothing that had been said as to the advantages of the supply was new to the people of the district, who knew its requirements. Not one ironmaster from Stockton had been called in favour of the bill, but some would be called to show that they were in accord with the corporation in opposing the bill. Notwithstanding the low price of the water, they did not wish to see the river drained dry. That price was obtained by the ironmasters promoting a rival scheme, which was abandoned on the company agreeing to a low rate. They preferred that the water should be more abundant, but they felt that this scheme would imperil the very source of the supply, and they had no fear that the rate would be increased to them, whatever the source to which the company must go, for they had still the same power of obtaining low rates which they had before. The independent evidence in support of this bill was very insignificant indeed. Dr. Farquharson had thrown an imputation on the Stockton Corporation with regard to the drainage; but he had himself been a member of that corporation, and had never said that the drainage was wrong. He only spoke of ventilation of the sewers; and the mayor would show that they paid the greatest attention to the sewage. The fresh water diluted the sewage in the river, and made it pure; and, therefore, it was necessary that there should be a good flow of the river water down to the tidal flow. The tidal flow drifted the sewage up and down, while the fresh water gave it an impetus which carried it out to sea. In the metropolis, the water companies were limited to one-fourth of the river flow, and this scheme would fall to the ground if the promoters were limited to one-fourth of the Tees dry-weather flow. That flow was only 26 million gallons a day; the promoters now took 8 million gallons, and they proposed to take more than 8 million gallons in addition. No doubt the population and trade of the district were rapidly increasing, and it was supposed by Mr. Hawksley that in 12 years the population might increase from 120,000 to 250,000; but suppose it should be 300,000, or more, the whole of the water of the river would be taken, and its bed become a muddy road. There was a probability of the Bessemer steel process, which required a great deal of water, being added to the other manufactures of this district. Indeed, Mr. John Brown, of Sheffield, in his evidence on the Wakefield Water Bill last session, said that his firm required 2 million gallons per day, and it must be remembered that all this was evaporated and not returned again to the river. The inhabitants denied that the water was of sufficiently good quality for domestic purposes, although it was good enough for manufacturers. They, therefore, urged that the company should go to another source, and make storeage reservoirs to retain the floods which Mr. Hawksley said were 300 times the low water flow of the river. Those floods were now wasted, and sometimes injurious; and, therefore, it would be wiser to impound and utilize them than to take so much water from the river in dry seasons. The 3d. per 1000 gallons was not the ordinary price paid at Stockton and Middlesbrough, it was a special rate for the ironmasters. But it might be worth the while of the ironmasters to pay a higher rate, if they could be sure of an abundant supply. Mr. Hawksley had said the works for storeage purposes would cost £2,000,000; but the cost of the Weardale works, with a similar population, had only been £1,000,000. In nearly every part of the north of England, Mr. Hawksley had advised gravitation works, and had constructed them for many companies. It could probably be done in this case for £500,000 or £600,000, as it was not necessary to lay the pipes along by the river; but by crossing the country with them the distance would be reduced one-half. The community objected to the impurity of the supply, and to the trade of the river being damaged. What his clients asked was that the promoters should not have those powers which would force the corporation to promote some alternative scheme. They were willing to incur any increased cost, in view of the unlimited quantity and improved quality of the supply.

Mr. *George M. Watson*, mayor of Stockton, examined by Mr. STANLEY, said that on the 2nd of March last the council considered this scheme, 26 members being present out of 32; and it was unanimously resolved to oppose the scheme. A meeting of ratepayers, held on the 5th of April, ratified that resolution. It was the general opinion in the town that the scheme would be injurious to the flow of the river. It was thought the water was not so good as it might be for drinking purposes. He had seen it of different colours, but never so clear as it had been shown to the committee, except when filtered. The captain of the fire brigade had complained of the want of pressure, which did not exceed 15 feet, and that was of no use in case of fire. It was not the fact that Stockton was badly drained, as, when new houses were built, the drains must be made to the satisfaction of the borough engineer. Dr. Farquharson had been a member of the council for six years, and made no complaint except that the sewers should be ventilated.

Cross-examined by Mr. RICHARDS: Stockton drained into the Tees, and they had not found any nuisance from it. It was a tidal river, and with a flood the fæcal matter would be taken away. The report of the captain of the fire brigade was not made on a fire, but it was when the brigade was out at a practice. The public meeting was attended by about 50 or 60, including himself, an alderman, and perhaps half a dozen councillors. According to the last census the population was 27,700.

Re-examined by Mr. STANLEY: As salt water was bad in conjunction with sewage, they wished to have all the fresh water in the river they could.

Mr. *George Edwards*, examined by Mr. STANLEY, said he had been borough surveyor of Stockton for 18 years. He had inspected the towns and villages on the Tees and its tributaries, to ascertain the extent of pollution by sewage. The population of Middleton-in-Teesdale was 2250, and it drained into a beck which ran into the Tees. The nightsoil and ashes were carted to the banks and thrown in. Barnard Castle had five woollen-mills, a flax-mill, a tan-yard, a carpet manufactory, and a dye-works. Previous to 1852 there were fever and cholera at Barnard Castle, after which the Public Health Act was applied to the town, and in 1853 a system of sewerage and water supply was carried out. There were over 250 water-closets in connexion with that system. He had seen the outfall of the main sewer, which discharged not less than 100,000 gallons daily, and it left a thick scum on the top of the water. Staindrop was a town of 1200 inhabitants, with a sewer along the main street, and it discharged into a beck, together with the contents of piggeries, cow-houses, &c. He saw the entrails of pigs and some carcases in the beck, into which the cemetery also drained. Gainford contained about 800 people, and there was an academy with about 120 pupils, which drained into the river. About 6000 gallons flowed daily into the river by that sewer alone, and there was another sewer which ran into the river below the town. That was about seven or eight miles from Tees Cottage. There was water flowing from the churchyard into the river. There were other small places which drained into the river above the intake. In summer he had frequently seen the river so low that people could walk across dry shod on stepping-stones. There was a good deal of sheep-washing in summer, when the river was low. He had known of drains being stopped in Stockton by the pipes of the company, and the footpaths were stopped near the Board School by the pipes lying there. The corporation paid 6d. per 1000 gallons for watering the streets. For sanitary purposes they paid 1s. 11d. per 1000 gallons, and £5 5s. per annum for the meter.

Cross-examined by Mr. RICHARDS: He thought the charge for water and the meter was over much, but he did not know the cost of the meter. He did not agree with previous witnesses that the sewage was got out of the water before it reached Tees Cottage. He did not think he had drunk above a gallon of Tees water in his life.

Mr. *James Hall*, surveyor to the South Stockton Local Board, examined by Mr. STANLEY, said he had to report on the bad state of the hydrants and the insufficient pressure, none having more than 15 feet, and some only 10 feet. A water-cart holding 290 gallons took 25 minutes to fill from a hydrant. There was no stand-pipe, and he thought they should have one. There was great inconvenience through leakage of the pipes washing away the subsoil. The company proposed that one of their new pipes was to be taken 550 yards through one of the main streets of the district. Altogether they had 3566 yards of road which it was proposed to occupy with pipes.

Cross-examined by Mr. RICHARDS: The population of South Stockton was nearly 10,000, and he objected to the pipes for supplying Middlesbrough passing through South Stockton. They were supplied from mains which passed through Darlington, but he did not object to that. He thought the company might pay rents for the use of the public roads. He was aware that all pipes were liable to leakage, but some of the work done by the water company was very bad.

Mr. *Ambrose Walker*, a member of the South Stockton Local Board, examined by Mr. STANLEY, said for the purpose of his business he drew the water from the Tees about two hours before low water, as he required it free from salt water. He had a filter-bed, and consumed between 5 and 6 million gallons a year. In 1864 he opposed the company diminishing the flow of the river, and the company were limited by Parliament to the 60 million gallons per week. The low water supply had diminished, and he had been obliged to lengthen his supply-pipe twice. He tasted the water almost daily, to make sure there was no salt water in it.

Cross-examined by Mr. SOMERSET: The charge per 1000 gallons was not more than the Act of Partiament allowed. Of course, the company would not be answerable for the frost affecting their pipes. He complained of the abstraction of the water from the river, which compelled him to lengthen the pipe for the supply of his works.

THURSDAY, APRIL 29.

Mr. *Christopher Young*, M.D., of Yarm, examined by Mr. STANLEY, said he had known the river for 20 years. His house and garden abutted on the river, in which he was in the habit of fishing. In 1871 and 1872 he noticed that the flow of the river at low water was very much less than in previous years. He put down a pump last year and pumped river water, which was slightly brackish. If he wanted fresh water at low tide, he would have to carry the pipe to within 4 yards of the Durham shore, although the bed of the river was 80 yards across. He was satisfied that the bed of the river had not raised. There were gravel beds over which a boat could go at one time, and they were now dry at low water. He knew the tank in which the gold fish were at the paper-mills. The water was pumped from the river, condensed by passing through the engine, and then flowed into the pond. They made brown paper at the mill, but they could not make white paper, because the water was not suitable. He took some measurements of the Tees the previous Saturday, and found that it flowed 18 feet in 10 seconds, that the width of the channel was 87 feet, the average depth 8·8 inches, the greatest surface velocity per minute was 108 feet, and the mean velocity, 87 feet. The company, in a former bill, took power to supply Yarm, but they had not done so. About 1000 of the inhabitants were dependent upon the river for water, and the rest on wells, the population being 1500. The floods in the Tees were very great, and on one occasion the water stood 3 feet in the streets of Yarm.

Mr. *Rowland*, examined by Mr. PATERSON, said he was a plumber, residing at Yarm. He knew the river well, and was sure the stream was decidedly less than 12 years ago. He proved this by having to lengthen the pipes used for pumping fresh water. Now, however, no one used the river water for domestic purposes on the east side of the town; but pumps were used to pump the tidal water. There were gravel beds below Yarm bridge, which could not be seen a few years ago. No doubt the water at low tide had subsided.

Cross-examined by Mr. RICHARDS: He knew that some rock was blasted below Yarm to improve the channel, but it had no effect on the bed of the river at Yarm.

Mr. STANLEY said that this closed the Stockton case, except with regard to Mr. Dodds, M.P., and other witnesses, who might afterwards be called to give evidence on the general merits of the opposition.

Mr. PATERSON then addressed the committee on behalf of the conservators of

the Tees Fishery Board; a large number of riparian owners, whose land was situated below the pumping station; the Darlington Rural Sanitary Authority; and the Stockton Rural Sanitary Authority. They all objected to any further abstraction of water from the river. The Fishery Board were interested in the whole course of the river and its tributaries, and were entitled to a full volume of water in a state of purity, and the fish in the waters. If any one interfered with those rights, they could proceed against him by action at law or injunction. The fisheries were exceedingly valuable to the owners, who anticipated further advantages by the operation of the Fishery Board, and the prospect of more beneficial legislation. In the lower part of the river the public fishermen pursued their avocations, and no definite value could be put upon them, as they paid a stated licence duty; but the more fish there were in the river, the greater would be the profit of each individual fisherman. The Fishery Board looked after the general interests of the riparian owners and the owners of fisheries, and derived part of their income from licences. Salmon came from the sea, and their instinct impelled them to push as far as possible into the upper streams of a river. There was an obstruction caused by the Dinsdale dam, but that had been considerably, and it was hoped it would be still further, reduced. A worse obstruction was, however, caused by the taking of the water at Tees Cottage, leaving dry places in the bed of the river. If the fish were prevented from getting up to the spawning beds, the stock would ultimately die out. Then, again, the water which did come down was much fouled, and drove the fish back, as their instinct made them abhor the very smell of sewage. The effect of drying the bed of the river would be to cut off the access to the spawning-beds, and the Tees must suffer very much by the deterioration of the fisheries. There were also facilities given to poaching by the bed of the river being made shallow, and there was a risk of the gravel spawning-beds being dried by the pumping operations, and the whole of the spawn being destroyed. The riparian owners and public fisheries would equally be prejudiced by the further abstraction of water, as the fish would not be there to be taken. The open season for fishing was from the beginning of February to the end of August, and that was the dry season. Was it necessary to do all this mischief in the interest of this company? They had already been limited to 60 million gallons per week, but they had been increasing their quantity although they had not reached the limit, and they had done great harm to the river by reason of their operations. The learned counsel then referred to the evidence given by Mr. Hawksley, in 1864, in cross-examination by Mr. Dodds, and contrasted it with the evidence given by the same gentleman before the present committee. In 1864 he said that the quantity of water passing the Tees Cottage in 24 hours in dry weather was 75 cubic feet per second, or 40 million gallons in 24 hours. A few days ago, however, he said that it was 45 million gallons per day. That was a calculation made upon the same data as he had formerly used, because he took the sections between 1848 and 1858. The measurements spoken to by Mr. Pole and other witnesses were not taken in fair dry summer weather time; and witnesses to be called would show that the dry-weather flow did not exceed 25 million gallons in 24 hours; that for weeks together Dinsdale dam was totally dry; and that at such times the water only flowed by the wheel and the fish-pass, so that Mr. Hawksley's estimate must be very far above the actual flow. The Fishery Board was constituted for the benefit of the public, and there was no personal interest in the matter whatever. Parliament had been trying for many years to restore the salmon rivers to their ancient state of productiveness, and the Fishery Board was engaged in carrying out this work. If this bill passed, Parliament would be pulling down with one hand what it had been building for so many years. Mr. Paterson then spoke of the great waste of the water supplied, and complained that there was no guarantee in the bill as to no more water being taken than was absolutely necessary. His clients objected to the water being taken at the place indicated, and would prefer to see the flood water impounded in the higher reaches of the river. The objection as to the cost of the works was overdrawn, as a large part of the pipes were already laid. But the expense was not so very much greater than that of the present scheme. The committee should draw the line somewhere, or the whole of the river would ultimately be taken at Tees Cottage; and his clients thought this was the proper time for such a line to be drawn. The sanitary authorities for whom he appeared complained of the impurity of the river, and said that if the quantity of fresh water were diminished there would be great inconvenience and danger to those who dwelt on the banks.

Sir *William Chaytor*, of Croft Hall, examined by Mr. PATERSON, said his estate was on the Tees, and he thought there were many places higher up the river where storeage reservoirs could well be made. He was aware of the limit, 60 million gallons per week, and was sure if they took much more than that it would have an injurious effect upon the river. The river was decidedly impure at Croft.

Cross-examined by Mr. SOMERSET: The abstraction of the water affected the purity of the river below. The sewage above the intake would make the water bad. He took an interest in this matter, because if the water was abstracted it would injure him. Mr. Scurfield called the meeting at which the petition against this bill was adopted; but he was not aware that the notices were sent out partially just to a few people.

Col. *George J. Scurfield*, of Hurworth House, examined by Mr. PATERSON, said he was a magistrate for the county of Durham, and a riparian owner on the Tees. Since the company began to pump the water, there was a small difference in the volume of the river; but it was so gradual that he could not say whether it was increasing or decreasing. The salmon did not attempt to pass up the river during June, July, and August—the hot months. The spawning-beds were above and below Dinsdale dam. Wherever there was a nice smooth gravel bed, the fish liked to spawn. Dinsdale dam occasionally obstructed the passage of the salmon, and it was often perfectly dry. Where the Skerne entered the river the smell was very bad, but the fish pushed their way through it. The complaint was that they would not stay near Hurworth, but went higher up. Clow Beck was about one-fourth the size of the Skerne. There was a considerable quantity of "hush" at times, which did not affect the fish, but it affected the fishing, as it made the water muddy.

Cross-examined by Mr. SOMERSET: The "hush" was the washings of the lead mines, perhaps 40 miles off. He had never seen the river near the pumping-station, but he knew the effects below.

By the COMMITTEE: When he saw Dinsdale dam dry six or seven years ago, it was dry across its whole channel. The fish had lately increased in the Tees, because they would not allow the spawn to be taken. The water was certainly lower at Hurworth; but he could not say whether it arose from abstraction of the water, or an alteration of the bed of the river.

Mr. *James Cookson*, of Neasham Hall, examined by Mr. PATERSON, said he was a magistrate for the county of Durham, and was high sheriff in 1871. Since the works of the company were commenced, the water flowing down the river in dry weather had much diminished, and this very much affected the fishing. He had a stud farm, the water for which was pumped from the river. It had been much discoloured of late years; and if more water was taken by the company, it would be still more impure. He had seen the top of Dinsdale dam perfectly dry—perhaps 20 times in three or four years. The Skerne where it discharged into the Tees was very black and discoloured, and he believed it had a bad effect on the trout. He fished a great deal himself.

Cross-examined by Mr. SOMERSET: He strongly objected to the bill. He was not a salmon, but he was a trout fisherman, and he found the fish very much worse fed in consequence of the introduction of injurious matter.

By the COMMITTEE: He did not know whether there was any diminution of water above the pumping station. He only fished on his own property, where he had a frontage of two miles.

Dr. *Joseph W. Eastwood*, of Dinsdale Park, examined by Mr. PATERSON, said he had resided there six years, and he was well acquainted with the Tees and the Skerne. He could not say much for the volume of the water, but the character of the water of the Skerne was very impure and foul. There had been fever at Croft and Hurworth, supposed to be in consequence of this. He had seen sewage deposited in a solid state on the rocks when the water was very low. If more water was pumped out by the company it would at certain seasons drain the river dry. He had repeatedly walked over Dinsdale dam when it was quite dry. He was the chairman of the Darlington Rural Sanitary Authority, which had not withdrawn its opposition to this bill.

Dr. *George E. Cockcroft*, of Hurworth, examined by Mr. PATERSON, said Hurworth was below Tees Cottage, and he had noticed that the water of the Skerne was black, and had a bad smell. He attributed an outbreak of typhoid fever to that cause. If more water were taken out of the river, the sewage would not be sufficiently diluted. Indeed, it was bad enough at present. [Witness generally confirmed the evidence given by previous witness.]

Mr. *John C. Chaytor*, examined by Mr. PATERSON, said he was a native of Croft, and was well acquainted with the Tees from Lower Melton to Elsdon Bridge. He had been an angler for about 60 years, and was now one of the river conservators. With regard to the fisheries, the company took far too much water already, and he had called the attention of the conservators to that fact. When the "hush" came down from the lead mains they were obliged to stop fishing. The small quantity of water in the river induced the fish to remain quiet instead of going up the river. Had often seen Dinsdale dam quite dry, and fish would not go up the pass unless there was a good deal of water. The Tees Fishery Board had taken great pains to improve the supply of salmon, by importing spawn from other rivers.

(To be continued.)

Legal Intelligence.

COURT OF CHANCERY.—FRIDAY, JUNE 11.

(Before Vice-Chancellor HALL.)

In re THE AIR GASLIGHT COMPANY.

Mr. OSBORNE MORGAN, Q.C. (with whom was Mr. W. W. KARSLAKE), on behalf of the company, asked that the petition might stand over for a week, in order that an affidavit filed the previous day by the petitioner might be answered. Mr. OSWALD, for various shareholders, supported this application.

Mr. DICKINSON, Q.C. (with whom was Mr. GRAHAM HASTINGS), for the petitioners, objected to the matter standing over.

The VICE-CHANCELLOR thought the petition had better be opened, and if it appeared to him necessary to answer the affidavit, he would allow the matter to stand over.

Mr. DICKINSON said the petition was presented by a creditor of the company for the purpose of having the company wound up compulsorily. During the interval that the petition had stood over, the company had passed a resolution to wind up, but his petition was presented before that date. The question raised was whether the gentlemen presenting the petition were proper petitioners or not. They were shareholders and creditors, but principally it was a creditors petition. The company was established on the 23rd of September, 1872, with a capital of £200,000, divided into 40,000 shares of £5 each. The object of the company was to carry into operation certain improvements in the manufacture of gas, invented or patented by Mr. Harrison, one of the petitioners. On a former occasion a petition had been presented by shareholders for winding up the company on the ground that it could not be prosperously worked; that although the invention was a clever one, the expense of bringing it into operation was so heavy that it could not be profitably worked. Mr. Harrison and others at that time succeeded in resisting the petition to wind up, and accordingly it was dismissed, his honour holding that he could not, on a shareholders petition, there being still assets outstanding, wind up the company. From that time the company had gone on. The price that was to be paid to Mr. Harrison, the patentee, for his patents, was £100,000, and he and his nominees had allotted to them a certain number of shares in the company, not paid-up shares, and they became the holders of those shares. By the 20th clause of the Articles of Association there was a provision for the payment of calls in advance. That being so, there was a sum of £26,000, which was treated as paid up by the petitioner in advance of calls, and the directors accepted and agreed, pursuant to that article, to pay interest at the rate of 5 per cent. The great point in the case was whether the £26,000 had been paid or not. The allegation on their part was that £26,000, being part of the purchase-money payable to this gentleman, was actually overdue, for which an action could be brought and judgment recovered. That £26,000 being still payable and demandable by the petitioner, he consented, instead of having it paid in cash, to have it applied as money paid in advance of calls; in other words, he could have presented a petition for winding up the company in default of payment of the £26,000, if he had not consented to the arrangement by which he was to be credited with the £26,000 in respect of calls. He now presented the petition because of the non-payment of the interest on the £26,000. On Jan. 12, 1873, the board resolved that interest at the rate of 5 per cent. should be paid on the £26,000, being capital paid in advance of calls on 13,000 shares. Then the petition mentioned the 20th article, and showed that there was due to the petitioner, after deducting all calls due from him, a sum of £1405 6s. 3d. due to him for interest upon the £26,000, credited to him in advance of calls. On March 12, 1875, the petitioner served the statutory demand for payment of the £1405 6s. 3d. upon the company, and the petition stated that the whole of that sum was due, and that the company was unable to pay its debts. The petition also stated that the company had not been successful, and that at the annual meeting, held on Jan. 28, 1875, Mr. Dolman, the chairman, expressed a wish that the company should be wound up, on the ground that it could not successfully carry on its business. The petitioners considering it desirable that the company should be reconstituted—though, of course, that desire of theirs could not be forced upon anybody—desired the directors to call a meeting for the purpose of considering the desirability of winding up the company, and reconstructing the same. That requisition was served upon the company on the 9th of April, but no meeting had been called in pursuance of it. On April 14, 1875, a notice was issued from the board convening an extraordinary general meeting for the 22nd, to consider the position of the company, the propriety of its continuing its business, and the expediency of adopting the recommendation of the directors that Mr. Harrison should resign his position, and also as to the propriety of winding up the company voluntarily or otherwise. So that instead of the meeting which the directors were requested to convene, they sent out a notice convening the meeting for the purposes which he had just stated. On the 22nd of April the meeting so convened was held, and the following resolution was carried by a show of hands:—"That the position of the company having been considered, it is resolved that it is expedient that the business of the company be discontinued, and that the company be wound up voluntarily." A poll having been demanded upon that, the same was fixed for the 30th of April, and resulted in 1386 votes for the resolution to wind up, and 617 against it. The resolution, although carried, was not effectual in winding the company up, in consequence of it not having the necessary proportion of votes. Under those circumstances, the petitioner, as a creditor of the company, which was utterly unable to continue its business or pay its debts, asked that it might be wound up. Mr. Dickinson then proceeded to read the evidence in support

of the petition, in the course of which the Vice-Chancellor stopped him, saying he would hear Mr. Morgan for the company.

Mr. W. Pearson, Q.C., said he appeared for Mr. R. Hewlett and 80 shareholders, holding 1736 shares, who also desired that the company should be wound up.

Mr. Hunter said he represented two shareholders, one for 50 shares, and the other for 10, and creditors for £30 or £40, who were anxious that the company should be wound up compulsorily.

Mr. Byrne said he appeared for six shareholders, holding 145 shares, who also supported the petition.

Mr. O. Morgan said, as representing the company, he objected to the petition *in toto*. The petition was founded upon the double ground of the petitioner being a creditor and a contributory. He denied that there was any debt due at all, or that there was any contract on the part of the company to pay interest on the £26,000 claimed by the petitioner. The purchase-money of £100,000 was not to be paid until three months after the shares had been allotted, but £74,000 was paid to the petitioner long before that time. On the 12th of February, there being £26,000 due, a resolution was passed that it having been represented to the board that the patentee was desirous, and had offered to pay up in full 10,000 shares, or thereabouts, standing in his name, resolved that such offer be accepted, and that the amount required to pay up in full the said 10,000 shares, or such of them as the patentee shall select, be entered in the book of the company as paid on account of the 10,000 shares, on the patentee signing a receipt for such moneys owing by the company. The resolution was confined to 10,000 shares, and up to that point nothing was said about interest. The resolution went on to say, "interest at the rate of 5 per cent. to be paid, if insisted upon by the patentee." Upon that resolution they had nothing more than an agreement that the calls on the 10,000 shares should be paid up in full, and there was no positive contract whatever as to the payment of interest, because interest was only to be paid if insisted upon by the patentee. His case was, that the patentee did not insist upon the payment of interest, because the very day after the resolution of the 12th of February, 1873, a deed of agreement was entered into under the seal of the company, and signed by Messrs. Harrison, which materially remodelled the resolution, and added a most important term. That deed was dated the 13th of February, 1873, and it recited that Messrs. Harrison were indebted to the company in the sum of £26,000 for and in respect of certain shares of the company held by them, or their nominees, and for which shares Messrs. Harrison were liable. Stopping there, they had an entirely new term introduced, for the resolution spoke of 10,000 shares, while the deed recited that the £26,000 was due in respect of certain shares. If £26,000 was due, it must be due upon some other shares than the 10,000 shares referred to in the agreement, because £2 being due upon each share there must be 13,000 shares, in respect of which the £26,000 was due. Then the deed went on to say that, in consideration of the £26,000 due and owing from Messrs. Harrison, they assigned unto the company the said sum, and it was witnessed that the company should hold the sum of £26,000 upon trust to use and occupy the same, and the company covenanted to expend the said sum of £26,000 assigned to them in payment of £26,000 then due and owing them, and that they would register the same on such shares as aforesaid, thus making the same fully paid up. There was not a word in that contract making them liable for interest, and he submitted that the deed which really defined the liability of the company was in effect a new arrangement entered into by the parties, and that his honour was bound to disregard the resolution, even if he thought it created a binding covenant for payment of the interest.

The Vice-Chancellor asked whether the company had ever repudiated their liability.

Mr. O. Morgan replied in the affirmative. Mr. Dolman, in his affidavit, stated that the only claim for interest was made on Dec. 31, 1874. Mr. Harrison, in the affidavit filed the previous evening—which they had not had an opportunity of answering—set out a letter of April 21, 1873, claiming interest on the £26,000 under the deed of Feb. 13, from the 10th of March. On April 23, 1873, the letter was read at the board meeting, when it was resolved that there should be a special board meeting for the purpose of considering the question, and that the solicitor be directed to attend. That special meeting was held on the 25th of April, when it was resolved that counsel's opinion be taken. On April 30, 1873, the matter was finally disposed of, for after Mr. Lindley's opinion had been read, it was resolved that, having regard to the opinion of Mr. Lindley, that £26,000, part of the purchase-money, may be applied in payment of the 13,000 shares in accordance with the deed of arrangement of Feb. 13, 1873, the arrangement be formally completed accordingly. That was an agreement on the part of the company, that the arrangement concluded by the deed should be carried out. That was communicated to Mr. Harrison's solicitors, and on the 8th of May they wrote a letter to the solicitor of the company, asking for a cheque for the interest. His case was that, as far as they knew, from that time till Dec. 31, 1874, there had been no application for interest.

Mr. Dickinson: Except that an action was commenced in respect of it.

Mr. O. Morgan said his friend was trying to establish a contract between a creditor and the company. By article 20, the directors had power to allow such a rate of interest on the shares as they, and the persons paying them up, might agree upon, and the question was, had such a contract been entered into to pay interest. If there had been, one would expect to find it in the deed of the 13th of February, 1873, but no such thing appeared in the deed, and there being that agreement between the parties, it would have been *ultra vires* on the part of the directors to have imported a new term into the deed, greatly to the advantage of Mr. Harrison, and greatly to the detriment of the company. They had never admitted their liability to pay interest upon the money, and the utmost that could be said was, that interest had been claimed and an action brought in the Lord Mayor's Court for the purpose of trying the question. The board having power to agree to pay interest, fully exhausted that power on the 13th of February, 1873, when they executed the deed, which provided that the £26,000 due on the calls should be set off against the £26,000 due to the company from Messrs. Harrison. There being that complete and concluded contract between the parties, he submitted it was not in the power of the directors to go out of their way to make Messrs. Harrison a present of the interest upon the £26,000.

The Vice-Chancellor asked what the company had to say about Mr. Harrison being a shareholder.

Mr. O. Morgan said if he was a shareholder he was in arrear with his calls, and therefore could not present a petition. The affidavit of Mr. Dolman stated that the petitioner, C. W. Harrison, was in arrear for two calls of 5*s.* each upon 210 shares, and also indebted to the company for moneys which he had received and never accounted for. Mr. Harrison, in his affidavit, denied being in arrear for calls, stating that the first call was deducted from his demand for interest; and that the second call did not become due till after the filing of the petition, and that he was not indebted to the company for moneys received and not accounted for. But as the call was due on the 23rd of April, and the petition not filed till the 1st of May, that statement could not be true; and with respect to the other allegation, it was clearly settled by authority that a shareholder was not entitled to set off against calls money due to him from the company. The petitioner could not present a petition as a shareholder without first paying the calls due from him; and by reason of the calls being in arrear, he was clearly not entitled to present a petition, unless he could show a right to set off. If his honour should be of opinion that the company ought to be wound up, it by no means followed that the order should be made upon the present petition, and he submitted that the petitioner had utterly failed in making out his case. He could not dispute that the company should be wound up; but he did most confidently resist the right of the petitioner to have it wound up, there being circumstances to raise a grave case of suspicion against him. But still if it was to be wound up, he hoped his honour would not grant the carriage of the order to the petitioner, but would leave the question of who should be liquidator open to all parties.

Mr. Oswald said he appeared for independent shareholders, who thought the company ought not to be wound up. He submitted that no order should be made upon Mr. Harrison's petition, and asked that it might stand over, in order to allow the parties an opportunity of answering the affidavit filed the previous evening.

The Vice-Chancellor thought there was no new matter imported into the affidavit sufficient to cause the petition to stand over, and that it was fairly and properly a reply to what had gone before.

Mr. Oswald said it was not for him to speculate what would be the ultimate fate of the company, but still he submitted that no winding-up order could be made upon the present petition.

The Vice-Chancellor said it appeared to him that there must be the ordinary order to wind up the company compulsorily. The petition was the petition of a creditor and contributory. As a creditor he had, in his last affidavit, stated that he was willing that his claim for interest should be investigated before the court in the ordinary way. He had mentioned, in the course of Mr. Morgan's address, rather to intimate that he was not disposed to rest the order entirely upon the petitioner's position as creditor, in order to leave it open, and not to express a final opinion upon that; nor did he express any final opinion upon that. But it was necessary he should, to some extent, refer to it, as it had a bearing on the point. But, if he had to determine it finally then, he should certainly determine the petitioner had a *locus standi* in his position as creditor. It certainly appeared to him that there was no such conflict as had been suggested by Mr. Morgan between the resolution entitling in its terms the party making the advance to interest if he chose to ask for it—and being an alleged creditor he had asked for it—and the deed which was signed contemporaneously; but the two stood perfectly well together. The creditor paid his money upon that memorandum, and claimed interest; and if he had to determine the question he should decide in favour of the petitioner. He only adverted to that for the purpose of showing its bearing upon the second position which the petitioner occupied—viz., that of contributory. As a large shareholder, he claimed to have the company wound up. This was the second time the company had been before the court, and upon the present evidence it was clear that the company had themselves resolved that the business could not go on, and to suppose that any good could come by deferring the winding up was to suppose that which would be most unreasonable and unjust. Then it was said the petitioner as a contributory was in arrear for calls, and that it was the rule of the court that a contributory in that position was not entitled to a winding-up order. That, as an abstract rule, under ordinary circumstances, was very just and right, and he did not mean to depart from the authorities in that respect. But the position of the petitioner as a shareholder, with regard to his arrears, was this. He was at all events *bonâ fide* claiming the interest, and there was no improper withholding of his calls, and, under those circumstances, it was no answer to say to him, in his character as shareholder, that there was a sum for interest on the one hand claimed by the company, which was on the other hand *bonâ fide* disputed by the petitioner. Under all the circumstances, it appeared to him that the order must go for winding up the company in the ordinary way. He would deal with the question of liquidator when it came before him in chambers.

Mr. Morgan: I understand your honour to leave the question of the liquidator open?

The Vice-Chancellor: Yes.

Mr. Dickinson: There will be the usual compulsory order to wind up, and the usual costs?

The Vice-Chancellor: Yes.

Saturday, June 12.

(*Before Vice-Chancellor* Bacon.)

PATTERSON *v.* THE GASLIGHT AND COKE COMPANY.

Mr. Davey said this was a summons adjourned from chambers, being an application by the defendants for an extension of the time for putting in their evidence. The suit was one of rather a heavy character, and had for its object the restraining of an alleged infringement of the plaintiff's patent relating to the purification of gas. The defence raised by the answer was, that there was no novelty in the alleged invention, that the plaintiff was not the true and sole inventor, and that it was not the proper subject of patent, and the infringement was also denied. The issues that would have to be decided would travel over all the points usually raised in patent cases. Notice of motion for decree was given on March 20 last, and the affidavits were filed in due course. The pressure which was now being put upon the defendants to hurry on the cause was somewhat novel, because the answer to the original bill being filed on Aug. 2, 1873, the bill was not amended till the following May—a period of eight months—so that the plaintiff had not shown such extreme diligence in the prosecution of his cause as to put himself in a position to put pressure on the defendants. It was a case in which necessarily the evidence was rather of a complicated character, and he was instructed that their witnesses would be not only their own officers and servants, whose evidence they had ready, but independent gentlemen engaged in the manufacture of gas; and, in consequence of the inquiry now being made before Parliament, as to the supply of gas to the metropolis, it had been difficult to get hold of these gentlemen so as to obtain their affidavits. The answer to the amended bill was filed on Nov. 28, 1874, notice of motion for decree was given on March 20, 1875, and the time for filing affidavits, which had been enlarged before, expired yesterday or to-day. The time was last enlarged on the 27th of May, and they then consented that the cause should be set down in order that the plaintiff should not be prejudiced by any delay which might take place by the putting in of their affidavits. The plaintiff had not set down the cause as he might have done, in which case he would have lost nothing by the defendants taking a reasonable time to put in their evidence. The plaintiff could not be prejudiced if a reasonable time were allowed, because he could set down his cause at once, which could not possibly be heard before the long vacation, and if his honour gave the defendants a month to complete their evidence, the plaintiff would have the whole of the long vacation to put in his affidavits in reply. The cross-examination would take place in court, and not before the examiner, and he was in a position to say that he should certainly want to cross-examine some of the plaintiff's witnesses, and no doubt his friend would wish to cross-examine his. As the case could not be heard before the long vacation, and the cause would be set down at once so as not to lose its place in the paper, he thought his honour would see that by giving a reasonable time to complete the evidence, the plaintiff could not possibly be prejudiced by the delay. Therefore he asked, having regard to the magnitude and importance of the case both to the plaintiff and to the defendants, and the nature of the issues which were raised, and also to the fact that in the earlier stages of the cause the plaintiff certainly took an unusual time in proceeding with it, that the defendants might have a month's further time in which to complete their evidence. A month would be quite sufficient for all purposes, and he did not think the plaintiff could be prejudiced by their having that time.

The Vice-Chancellor inquired whether the application was opposed.

Mr. Kay, Q.C. (with him Mr. Tremlett), said he opposed the application.

The VICE-CHANCELLOR said this was a matter not new to him, as it had been discussed in chambers, and he was satisfied then that there was no reason why the defendants should not have completed their evidence, and that was the only question now before him. Having listened to the plausible, he might say captivating, statement of Mr. Davey, he could not see that the reasons alleged were reasons for delaying the plaintiff in the prosecution of his cause. If the plaintiff took eight months to amend his bill, for ought his honour knew that time was necessary, by reason of his case and the case raised by the answer. He did not at that moment recollect the dates, but was satisfied from the discussion before him the defendants had had quite sufficient time to adduce the evidence in support of their case. He could not attend to the statement that the defendants had difficulty in getting the evidence of scientific men, because he considered the scientific gentlemen would find time to make the affidavits, no matter what other occupation they were engaged in. He could not see anything in the case but a desire on the part of the defendants to delay the hearing, so as to throw it over the long vacation. Upon the plain ground that the plaintiff desired to have his cause, which hitherto he had been unable to bring to a hearing, now disposed of, and upon the conviction which he entertained that the defendants had in their hands the means of adducing all the evidence they could require, he must refuse the application.

Mr. KAY: With costs?

The VICE-CHANCELLOR: Yes.

Mr. DAVEY said he supposed a reasonable time would be given to put in their affidavits.

Mr. KAY said he did not wish to act harshly, and would give his friend a week to put in the affidavits.

The VICE-CHANCELLOR thought the defendants had succeeded by the application in chambers, and by adjourning it into court, to get a little longer time than they otherwise would have had.

Mr. DAVEY hoped a fortnight would be allowed.

Mr. KAY said he could not agree to a fortnight being given.

The VICE-CHANCELLOR said, if he were not under the profound conviction that the defendants had had, and would have, sufficient time to do everything which justice entitled them to do, he would have acceded to the application. A week's time would be sufficient.

COURT OF QUEEN'S BENCH.—TUESDAY, JUNE 8.

(Sittings in Banco, before Justices LUSH *and* QUAIN.)

COMMERCIAL GAS COMPANY *v.* SCOTT.

Mr. WATKIN WILLIAMS, Q.C., and Mr. SUTTON appeared for the plaintiffs, who were the appellants; Mr. KYDD appeared for the respondent.

This was an appeal from a decision of Mr. Bushby, the stipendiary magistrate at Worship Street Police Court, by which he had imposed certain penalties on the Commercial Gas Company for discontinuing to supply gas to the respondent, a publican in Shoreditch, without giving him the requisite month's notice in writing, he not being in arrears, and not having committed any breach of the company's Acts.

Justice LUSH, in delivering judgment, said: I am of opinion that this conviction is right. The Gas-Works Clauses Act of 1847 was a model Act, which was to be applied only to such gas-works as should be authorized by any Act of Parliament thereafter to be passed, which should declare that that Act was be incorporated therewith. Then came the special Act of 1852, which established the plaintiffs company, and in which there was a clause incorporating the general Act of 1847. So it stood until the year 1860. In that year an Act was passed for better regulating the supply of gas to the metropolis, called the Metropolis Gas Act (1860), which I believe I am correct in saying enumerated all the gas companies in London, and this amongst the rest; and recited that these companies, having been incorporated by Act of Parliament for the purpose of supplying the several districts, instead of supplying gas by several mains in the same district, had agreed, as far as possible, each one to confine its supply to a separate district, in order to economize capital, and to avoid the too frequent opening of the public streets; and, subject to the provisions and restrictions of this Act, it was expedient that such districting should receive the sanction of Parliament. Parliament thus sanctioned the monopoly—that is, the appropriation to each company of a special district of its own. Then the enactment in the second section: "The Gas-Works Clauses Act, 1847 (except so far as the provisions thereof are inconsistent with this Act), is incorporated with and forms part of this Act, and shall apply to the several companies before named or referred to, as fully as if the gas-works of the several companies were authorized by this Act." Therefore, from that time the Act of 1847, as amended by the Act of 1860, was directly applied to all the gas companies of the metropolis, this company by name amongst the rest. And the operation of that Act upon those companies did not depend upon the incorporating clause of the private Act, but, by virtue of the general enactment in section 2, had the same effect as if there was no incorporating clause in that Act. Then came the Act of 1871, which was also another model Act—not an Act solely for the metropolitan companies, like the Act of 1860, but a model Act for appropriation by any company which should thereafter receive incorporation under Act of Parliament, and the first clause says: "The Gas-Works Clauses Act (1847) and this Act shall be construed together as one Act, and the provisions of this Act shall be held to repeal and supersede such of the provisions of that Act as are inconsistent with this Act." That of necessity, therefore, takes in the Act of 1860, because that took in the Act of 1847, and said the Act of 1847 and the Act of 1860 should be read as one Act. This clause, therefore, takes in the Act of 1847 with this Act, and repeals such provisions of it as are inconsistent with that Act, and that therefore incorporates the Act of 1860, and that Act applied of its own force to this company, so the Act of 1871 must apply to this company appropriated to it in the Act, and by the terms of the Act of 1860 all that was applicable to this company. I cannot, therefore, in the slightest doubt that every provision in the Act of 1871 governs all the London companies. Indeed, it would be an extraordinary thing if it were not so, because that Act was taken to secure a great benefit to the public and advantages to the companies; and, amongst others, it appointed public examiners, by whom the illuminating power of gas should be tested from time to time, and other regulations. It would be an alarming thing to the inhabitants of the metropolis to find out that not one of those provisions—for that would be the consequence if Mr. Williams's argument was to hold good—that not one of those provisions would be applicable to any part of the metropolis. The conclusion would shake and astonish any person that paid the least attention to the discussion that went on in that year in Parliament about the supply of gas. That being so, the question is, what is the proper construction of the 36th section? The company here had laid down and supplied gas to the applicant, and they had cut off the supply of gas without giving the month's notice to pay the arrear of rent. Are they liable under the 36th section? I am clearly of opinion they are. To understand that section, one must go back to the 11th section. I should say that the 14th section of the Act of 1860 required the company to supply gas to every person who chose to demand it of them, whose premises were within certain distances of the mains, but it provided no special remedy in case they did not do it, they could only be sued. The 11th section of the Act of 1871 says: "The undertakers shall, upon being required so to do by the owner or occupier of any premises situate within 25 yards from any main of the undertakers, or such other distance as may be prescribed, give, and continue to give, a supply of gas for such premises, under such pressure in the main as may be prescribed, and they shall furnish and lay any pipe that may be necessary for such purpose, subject to the conditions following;" that is, the conditions about the expense of laying down the pipes, so that they are here reiterating the obligation to supply; but they add to it, you shall not only supply gas, but shall supply it under the prescribed provisions. Then the 36th section must be read in connexion with that: "Whenever the undertakers neglect or refuse to give a supply of gas to any owner or occupier of premises within the limits of the special Act entitled to the same, under such pressure as is prescribed, they shall be liable to a penalty not exceeding forty shillings for each day during which such default continues." That is a cumulative provision, which says, in effect, whereas you were required to supply gas, but there was no penalty for not doing it, we now require you to continue to supply gas, and supply it under a particular pressure. If you do not do so—if you neglect either part of your duty—that is, either to supply the gas at all, or to supply it at a given pressure—you shall be liable. That is the meaning which I think clearly that clause bears. It was not confined to the supply under a given pressure, but it is applicable to the neglect to supply at all, as to supply the proper quality. Therefore, I am clearly of opinion that the magistrate was right.

Justice QUAIN: I am of the same opinion. It appeared from the argument of Mr. Williams that the Act of 1847 applied to his client; but the moment that argument disappeared, it appeared to me there was an end of the whole case, and, that it disappeared, is clear from the Act of 1860. The Act of 1847 said it should be applied only to such companies as had any incorporating clause, and accordingly it only applied to those companies who showed in that way they incorporated it; but the policy of the Legislature has since changed, and now the application of those general provisions is applied by the Legislature themselves to all the companies, because we have an express provision in the Act of 1860 that the Act of 1847, as altered or modified by that Act, should apply expressly to all these metropolitan gas companies, although that Act was passed in 1860, and the private Act of the present company was passed in 1852. We have, therefore, by virtue of the public Act itself, the provisions of the Act of 1847 applied to this very company. Now, what does the Act of 1871 do? As I read it, by the first section, it really provides that, instead of the Act of 1847, the Act of 1847 as modified by this Act shall apply to this company. By the 3rd section, therefore, it shall apply to the future companies, whether those future companies contain a clause incorporating the public Act or not. It expressly provides it, and when you consider that the Act of 1847 already does apply to all these companies, all this Act says is, that the Act of 1847 shall be altered or modified by this Act, which is, in effect, saying the Act of 1847, as modified by this Act, shall apply to all those companies whom, by the Act of 1860, that Act of 1847 applied to. It seems to me, therefore, to be perfectly clear, by virtue of that section of the Act of 1871, the 36th section of that Act is applicable, and the magistrate has properly allowed the summons to be amended, and has convicted the company. I have no doubt that, reading the 11th section as my brother Lush has just done, it does apply to this case, as stated by the magistrate, and that this conviction was a very proper one.

Mr. KYDD: I am not sure that it is necessary to ask for the costs.

Justice LUSH: The costs follow.

LIVERPOOL COUNTY COURT.—WEDNESDAY, JUNE 2.

(Before Mr. P. THOMPSON, *Judge.)*

PRESTON *v.* HUYTON AND ROBY GAS COMPANY.

Mr. SEGAR appeared for the plaintiff, and Mr. JAMES for the defendants.

The plaintiff was Mr. *R. W. Preston*, merchant, Rydal House, Grasmere Park, Huyton, who sued the Huyton and Roby Gas Company to recover the sum of £39 12s. 7d., "being money had and received by the company for his use, through the defendants having charged to and received from the plaintiff that amount for gas between the months of September, 1870, and February, 1875, both inclusive, in excess of the amount actually consumed by him." Since the action was brought, the plaintiff reduced the amount which he claimed to £29 16s. 5d., and the defendants had paid £3 0s. 8d. into court. The plaintiff had been a consumer of gas, which was supplied by the Huyton and Roby Gas Company, for about five years, and during that time he had paid them £213 12s. The gas was supplied through two meters—one a 20-light meter, and the other a 3-light meter; the latter being used to supply gas for the purposes of a cooking-stove. The plaintiff, suspecting that the meters were registering more gas than he consumed, had them tested, and the result was the present action against the company, to compel them to return money which, it was alleged, had been overpaid in the gas bills.

Mr. *Daniel Horton*, assistant-inspector of gas-meters for the Corporation of Liverpool, stated that he was present when the meters were tested at the municipal offices. They were tested by a gasholder which was stamped and approved by the Exchequer authorities. Both the meters were defective. The 3-light meter registered 20 per cent. against the consumer, and the 20-light meter 15 per cent. against the consumer. The smaller meter had always been out of order and could not work properly, and the gas company's officers, who went round to examine meters about every six weeks, must have seen that it was out of order, and was burning against the consumer. The small meter would not work at the correct level, and the large meter at the correct level was 1 per cent. in favour of the gas company. At the low-water level it worked right.

Mr. *Alfred Glover*, in the employ of the corporation, who had tested the meters in the presence of the last witness, confirmed his statement.

Mr. *T. C. Williams*, inspector of gas-meters at Salford, said he tested the two meters on the 17th of April, at Mr. Horton's office in Liverpool, by means of the gasholder stamped by the Exchequer authorities. The 20-light meter at the high-water level showed 13½ per cent. against the consumer, and at the correct water level 10½ per cent. against the consumer. The 3-light meter at the high-water level was 19¾ per cent. against the consumer; at the low-water level the float stuck, and that would be against the company. At the lowest water-line the large meter was 2 per cent. in favour of the consumer.

The *plaintiff* stated that the meters were removed in the early part of the present year, and dry meters put in their place. Since the new meters had been put in his house, although the gas was burning during the same period, his bills had decreased in one case by about one-half, and in the other by about one-fourth.

This was the plaintiff's case, and evidence was then called on behalf of the defendants.

Mr. *H. Hill*, manager of the Huyton and Roby Gas Company, said that, according to his computation, the plaintiff, taking the time the meters had been in use, was consuming more gas by the present meters than by the old ones which were removed. Witness sent the old meters to be tested at Oldham.

Mr. *Toulson*, gas-meter inspector, Oldham, said he tested the meters in question. They were old meters, but their working order was good. The large meter at the correct level was 2·04 per cent. against the consumer, and under the Act of Parliament 2 per cent. was allowed, so that he as an inspector should have passed it as correct. At the low-water level the meter was 4 per cent. in favour of the consumer. At the high-water level it was 12·36 per cent. against the consumer. He tested the smaller meter, and found the float to work correctly. At the correct level it registered 0·4, which was practically correct. At the low-water level it was 9·09 in favour of the consumer, and at the high-water level it was 25 per cent. in favour of the company. He tested the meters by the standards provided by the Exchequer authorities. He could not reconcile what Mr. Horton had said as to the meter not working at the correct level. He spent about five hours in the testing, and was sure he was correct.

Mr. *Hiller*, in the employ of the Liverpool United Gaslight Company, said he had also tested the meters, and had no difficulty in getting the smaller meter to work at the correct level. At the correct level it was 1·42 per cent. in favour

of the gas company; at the low level it was 16 per cent. in favour of the consumer; at the high level it was 27·23 in favour of the company. The larger meter at the correct level was 2·77 per cent. in favour of the company; at the high level 13·47 per cent. in favour of the company; and at the low level it was correct. Judging by the water-line, it had worked the greater part of the time at the correct level. He tested them two or three times, and got the same result.

Mr. *Rayner*, foreman to Messrs. J. and J. Braddock, meter makers, Oldham said he had also tested the meters. The small meter at the correct level was 1 per cent. against the gas company; at the high level it was 18 per cent. against the consumer; and at the lowest level it was 9 per cent. against the company. The large meter at the correct level was 2·075 per cent. in favour of the company at the high level 11·45 per cent. in favour of the company; and at the lowest level 4·55 per cent. in favour of the consumer. From an examination of the interior of the meters, he concluded that they had worked more in favour of the consumer than of the seller.

Mr. SEGAR contended that there was no evidence to show that the meters had worked at the levels which would be in favour of the consumer, but, on the contrary, had worked at the levels which would be in favour of the gas company. With reference to the conflicting evidence, he remarked that gentlemen could not lie, and the testing gasholder could not lie, and so what had to be done was to make it work to the figures which were wanted.

His HONOUR said the evidence went to show that it behoved all gas consumers to look after their meters, and see that the water did not stand higher than the correct level. He really could not come to any certain conclusion satisfactory to himself as to what the rights of the gas company were; but upon the whole his impression was in favour of the defendants, and that being so he should nonsuit the plaintiff.

Some discussion then took place as to costs, and his HONOUR said the plaintiff would get the amount of money paid into court and his costs up to the time it was paid in.

Mr. JAMES urged that the defendants should have costs, as they had been put to great expense, and they might be inundated with actions of this sort if they had to pay their own costs.

His HONOUR, however, said he did not think he ought to grant costs.

The *plaintiff* having stated, in reply to Mr. JAMES, that he should not carry the case any further, it was agreed that the verdict should be entered for the defendants, without costs.

SOUTHWARK POLICE COURT.—THURSDAY, JUNE 16.
(*Before Mr.* PARTRIDGE.)

DEFRAUDING THE PHŒNIX GAS COMPANY.

Francis Jones, the landlord of the Old Farmhouse beer-shop, Hooper Street, Westminster Road, was summoned for disconnecting the pipe from the meter, without the consent of the company, and using the gas unknown to them.

One of the meter examiners in the employ of the Phœnix Gas Company, Bankside, said that on the morning of the 3rd inst., a little after eleven o'clock, he went to defendant's house to examine the meter. He saw defendant behind the bar, and told him what he wanted. He said, "You can't see the meter now, you must call again." Having a suspicion that something was wrong, he refused to do so, and told him he must see the meter immediately, and as the meter was placed in a recess outside the bar, he opened a door and found the pipe leading to the meter disconnected, and an india-rubber tube fixed to the supply-pipe, the consequence of which was that the defendant was using gas unknown to the company, therefore defrauding them. He believed, from the state of the india-rubber tube, that it had been used for some weeks.

Mr. EDWIN, who appeared for the defendant, said that the gas had been so bad recently that to get a good light his client employed a friend to fix the tube, but with no intention to defraud the gas company.

Mr. PARTRIDGE, saying it was a most shameful fraud, fined the defendant £5, and costs.

BRISTOL POLICE COURT.—TUESDAY, JUNE 8.
(*Before Messrs.* W. H. TERRELL *and* W. HATHWAY.)

EXTINGUISHING PUBLIC LAMPS.

William Jenkins, a young man, was charged with wilfully extinguishing a public gas-lamp in Clifton Wood.

Mr. BOX, from the office of Messrs. M. Brittan and Sons, appeared to prosecute on behalf of the Bristol United Gas Company, and stated that much annoyance and loss had been caused to the company latterly by offences of this character. In one week alone so many as 64 street-lamps were broken, in addition to a large number being extinguished. These offences had been increasing for some time past. The attention of the chief superintendent of police had been drawn to the matter, and he had written to the company, assuring them that there should be increased vigilance directed to the protection of the public lamps.

Police-constable 278 deposed that, between twelve and one o'clock on the previous night, he saw the defendant come along near the lamp, climb up the post, and extinguish the light; and he took him into custody.

Defendant, in reply to the charge, said he had been to a little party, and on coming away with his friends they saw the lamp "right outside the door." One of his friends said, "We will put the light out;" and, in a thoughtless moment, he climbed the lamp and extinguished the light. He saw his error now.

The MAGISTRATES said it was a very serious offence, and they fined the defendant 40s. and costs, or in default a month's hard labour.

LEWES WATER SUPPLY.—The *East Sussex News* says that "after overcoming great difficulties, the Lewes Water-Works Company have been eminently successful in improving and increasing the water supply. We explained some time since that they intended sinking iron cylinders to a considerable depth, and, after cementing the floor of the well, to continue the boring through its centre into the chalk rock. This has been done to a depth of nearly 120 feet, and the water now rises so rapidly that it is estimated over 1000 gallons per minute can be obtained with the pumps in full work. Coming as it does from the chalk rock, it is natural to suppose the water is particularly clear and bright. The work has been carried out by Messrs. Eason and Anderson, the eminent engineers. The company are to be congratulated on the success which has attended their energy and determination to keep pace with the wants of the town."

BURSLEM AND TUNSTALL GAS COMPANY.—The annual meeting was held on the 28th ult.,—Mr. A. Shaw, the chairman, presiding. The following report was read:—"The directors, in submitting the statement of accounts, offer their congratulations to the shareholders upon the renewed prosperity of the undertaking. The balance of profit amounts to £3591 6s. 6d., out of which sum your directors recommend the payment of the usual dividends, after which there will remain a balance of £756 6s. 9d. to carry to reserve account. The directors announce with regret the resignation of Mr. Henry Wcodall, who for nearly ten years has given much satisfaction as manager to the company, and who has been appointed engineer to the Leeds Corporation Gas-Works. Your directors have appointed Mr. Henry Peaty in his stead, and have much confidence in their selection. Benjamin Cork, Esq., for many years a much-respected member of the board, having died in the middle of the term of office, your directors have elected W. Woodall, Esq., J.P., to fill the vacancy. Three directors—A. Shaw, Esq., J.P., Joseph Alcock, Esq., and Joseph Shirley, Esq., and one auditor, John Gates, Esq., retire by rotation, and offer themselves for re-election."—The report was accepted as most satisfactory, and adopted, and the retiring directors and auditor were re-elected.

Miscellaneous News.

BRITISH ASSOCIATION OF GAS MANAGERS.

The Twelfth Annual General Meeting of the Members of this Association was held during the past week in the Lecture Hall of the Leeds Philosophical Society, Park Row, Leeds. There was a large attendance of members and visitors at each of the sittings.

TUESDAY, JUNE 8.

The first sitting was held this morning. The PRESIDENT (James Paterson, Esq., F.G.S., of Warrington) took the chair at eleven o'clock.

The minutes of the last general meeting and the financial statement for the past year (which had been previously printed and circulated amongst the members) were taken as read, and, on a show of hands, were approved.

NEW MEMBERS.

The SECRETARY (Mr. W. H. Bennett) read the list of applications for membership, as follows:—

ORDINARY MEMBERS.

Barnsley, F.	Alton.
Belton, W.	South Shields.
Bickerton, Geo.	Goole.
Blackburn, J.	Hebden Bridge.
Botley, C. E.	Wormwood Scrubs.
Broadberry, C.	Harwich.
Budden, J.	Poole.
Chadwick, J.	Oldham.
Chester, J.	Swinton.
Cleland, W.	Liverpool.
Coombs, J. A.	London.
Croft, W.	Morley.
Cross, W.	Leamington Priors.
Dow, A. G.	Kings Lynn.
Dunlop, W.	Hamilton.
Dyson, E.	St. Helen's
Elliott, Jas.	Ludlow.
Garlick, J.	Carnforth.
Gloag, R. J.	Stockton-on-Tees.
Gooch, Geo.	Bournemouth.
Hall, Josh.	St. Helen's.
Hassall, C. T.	Whitchurch.
Hislop, L.	Bothwell.
Howitz, Geo.	Copenhagen.
Jaques, Jas.	Stockport.
John, H. T. A.	Messina.
Kelsall, Jas.	Bahia.
Linging, S. R.	Etruria.
Lukey, R. J.	Falmouth.
Lupton, Jas.	Leeds.
Mackenzie, W.	Dunfermline.
Malam, A.	Dumfries.
May, T.	Calcutta.
Marr, R.	Sandown.
Mills, W. P.	Dartford.
Monson, P.	Dewsbury.
Moorhouse, R. K.	Epsom.
Murray, S.	Uttoxeter.
Peaty, Hy.	Longport.
Porteous, W.	Hendon.
Proud, T.	Birmingham.
Riley, F.	Bishop's Stortford.
Roberts, W. T.	Altrincham.
Russell, F.	Ilfracombe.
Sparke, J. B.	Leeds.
Shaull, E.	Penrith.
Smith, W.	Darlington.
Timmins, Jos.	Leigh.
Walker, W. A.	Elland.
Watson, W.	Sheffield.
Whitaker, J. W.	Wakefield.
Whitehead, J.	Dronfield.
Winstanley, Geo.	Coventry.
Winstanley, W.	Newcastle-under-Lyne.
Wright, G.	Redcar.

It was unanimously resolved—"That the gentlemen whose names have now been read be elected ordinary members of the association."

The SECRETARY read the names of the following gentlemen, who had applied to be admitted as extra-ordinary members of the association:—

EXTRA-ORDINARY MEMBERS.

Cockey, F. C.	Frome.
Kelly, R. R.	London.
Thomas, Henry	Oldham.

The above-named gentlemen were unanimously elected extra-ordinary members of the association.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I come before you to-day in much fear and trembling. The large and intelligent audience before me, the high position of the respective gentlemen who have preceded me in the presidential chair—names that will be transmitted to posterity as having conferred, by their distinguished abilities, a high place to the British Association of Gas Managers amongst the more important societies of our times—conspire to make me feel sensibly my own insufficiency and imperfections, and to ask of you your kind forbearance, co-operation, and support.

It affords me much pleasure in being able to congratulate you upon the continued prosperity of our association. Year after year continues to add to its numbers and influence, which of itself may be regarded as the best evidence of its appreciation and usefulness. The series of papers brought forward from time to time have generally been of a highly instructive and valuable kind, and the proceedings, taken as a whole, form an important epitome of the science of gas lighting. We are not, however, exempted from the mundane changes which afflict society, and we are filled with something more than regret in having to record the death, during the past year, of the following members, viz.:—Mr. Daniel Helps, the outdoor superintendent of the Bath Gas Company; Mr. Thomas Hughes, who was connected with the Surrey Consumers Gas-Works, in London; Mr. Orlando Brothers, of the Gas-Works, Blackburn, a young and promising gas engineer; Mr. John Foxall, of the Beverley Corporation Gas-Works, who, for the long period of 30 years, held the office of manager. The death of Mr. John Edward Clift, formerly proprietor of the Redditch Gas-Works, and for 20 years engineer of the Birmingham and Staffordshire Gas Company, is a loss to the profession. We have also to notice, with feelings of deep regret, the loss of our much-esteemed friend, Mr. Thomas H. Methven, of the Bury St. Edmund's Gas Company, a gentleman who had endeared himself to the members of this association by his uniform kindness and genial temperament, and who had always taken a warm interest in its progress and prosperity. His papers contributed to the association were uniformly of a practical and

suggestive kind, and I need not say his presence will be much missed at our annual gatherings.

Lastly, it is my painful duty to record the death of our esteemed and amiable friend, Mr. Jabez Church, a gentleman who has deservedly won the respect and esteem not only of the members of this association, but of the great body of civil engineers of which he was a distinguished ornament. Mr. Church was a native of Essex, and about 28 years ago became engineer of the gas-works at Chelmsford, where he continued to reside, having professional chambers at Westminster. As a civil engineer his abilities were of a high order, and opened for him a very extensive and increasing parliamentary practice. Besides having been retained as consulting engineer for numerous gas companies, there were few opposed gas bills brought before Parliament in which he was not engaged; and I understand the last duties in his public career of usefulness were the preparation of evidence in support of the Colchester Gas Bill passing through Parliament, in which Mr. Spice was his colleague. In 1854, Mr. Church was elected an associate of the Institution of Civil Engineers, and became a member of that body in 1870.* In 1871 he was elected to the office of president of the Society of Engineers, and in the same year was unanimously chosen president of this association, the duties of which office he discharged with singular ability and honour. There are not many gentlemen connected with the profession who have left behind them a more distinguished mark on the pathway of time than that of Mr. Church. He was possessed of great prudence and sound judgment; and, while there were few to equal him in the extent and accuracy of his professional knowledge, there was probably none more highly respected for integrity and worth, and for that courtly and gentlemanly disposition which led him to pay uniform deference and respect to those who were professionally opposed to him. I cannot express my own sentiments in more appropriate language than that of a gentleman belonging to his native town, who sums up a brief notice of his life in the following well-merited sentences:—"He had, indeed, every title to respect. There was not a grain of guile, jealousy, or ill-nature about him. A fine specimen of an Englishman, at once in appearance and character, he fought the battle of life with honour, ability, courage, and energy, and, we are happy to say, with conspicuous success, while his personal qualities—the ever-ready smile, the nice word, the chivalrous kindness—endeared him to countless friends, as they have done to the writer, who will long regret that his sun should have gone down while it was yet day."—(The Editor of the *Essex Herald*.)

The members upon the roll at the beginning of this session were 546, of which six have been removed by death, and to-day you have added 55 ordinary and 3 extra-ordinary members, making a total membership of 590.

In olden times, when the imperfect knowledge of letters was confined to the cloisters of monks, and when every family required the protection of a piece of the rowan-tree (*Pyrus aucuparia*) placed above the door as a charm against the influence of witchcraft and other supernatural agencies, whose malign influences were greatly dreaded, this stick of the rowan-tree generally served the two-fold purpose of protection against the imps of evil, and as a record of important events connected with the family, by having a notch cut in it to chronicle certain occurrences, each notch representing a distinct series of incidents, read and understood at a glance by the domestic historians. In like manner, though the proceedings of this association are chronicled with great fidelity in your yearly volumes, it will probably be considered neither superfluous nor out of place to recapitulate the subjects brought before the association during the first decade of its operations.

During the year the interests of gas undertakings and the consolidation of the profession have been further secured and increased by a similar association of gas engineers having been instituted in France, under the presidency of Monsieur M. A. Mallet. I am quite sure that in wishing it a success not inferior to that of the British Association, I am only giving expression to the sentiments of every gentleman present. Their first report, though brief in its details, enters into some of the most important elements of gas manufacture, and gives rise to a well-grounded hope of its future usefulness.

At the last annual meeting our respected and esteemed president, in his valuable and suggestive address, adverted to the "Qualifications of a Gas Manager," and as every subject is capable of being viewed in different aspects, I venture briefly to say a few words on the

Relations which Subsist between Gas Companies or Corporations and their Managers.

To enter into these considerations in a comprehensive way would occupy too much of your time, and, important as they are in their bearings and results, I will only touch upon them slightly. The duties of the manager have been so ably and fully expressed by our friend, Mr. Livesey, that any further comment here would be superfluous. Suffice it to say they are both numerous and onerous, demanding his attention whether by day or night, but, notwithstanding the burdensome nature of these duties, they ought to be discharged with a scrupulous regard for the interests of the employers, and with the same care and solicitude as if the works were his own property. Nothing short of this will meet the relations to which I have referred. Without a unity of interests there can be no unity of feeling, without a unity of feeling no permanent satisfaction, and without satisfaction no personal enjoyment in the discharge of duty.

On the other hand (and to which this paragraph more particularly refers), the owners of such undertakings should not be too reluctant to acknowledge, at least with gratitude, the efforts of men who are faithful and devoted to their service, even should they fail in realizing, as the results of their diligence, all that could be desired. On this point I venture to believe a very general error prevails. It is not unusual to issue a series of questions relating to the selling price of gas, which in many cases are worse than useless, as they are misleading. In returns of this kind for comparative purposes, it is necessary that all the circumstances connected with capital, quality, and manufacture should be known and equated to the terms obtained by the questioning company. It will not do to say that because gas is sold in one town at the rate of 3s. 6d. per 1000, *ergo* gas of the same quality should be sold in every other town at the same price, and the manager who fails to do so must not be blamed until all the facts are known. Should there be any cases of excess in charge traceable to inferior management, I am disposed to think they will be confined to the smaller class of works, and if existing, in any case it is doubtful whether the directorate may be quite free from blame in the matter, or whether they do not contribute directly to produce such results. In the election of a manager, it is not by any means a rare occurrence that choice is made of the person who is willing to serve them for the smallest remuneration, which I cannot help thinking is mistaken economy, and fraught with great danger. Under such circumstances it is not impossible that they may obtain the services of a good man, but the probability is that it may be otherwise. And in such a contingency, there are only two courses open to them—either they must place themselves under the advice of a qualified engineer, or submit to the loss they are likely to incur. It occasionally happens, even in the experience of highly qualified men, that their best applied efforts, whether in relation to construction or management, are counteracted by the interference of the directorate, while at the same time he is held responsible for the results. Such a course is far from being desirable, as it is almost certain to be productive of direct loss to the company. It is also attended with the probability that by the discouragements the manager thus meets with, the incentives to effort are removed, and matters allowed to go on with careless indifference. The success or non-success of a gas company, as in other undertakings, must necessarily depend, to a material extent, upon the energy and qualifications of the manager, who ought in all cases to possess the entire confidence of his directors (otherwise they are not justified in retaining his services), and it is highly important he should not be interfered with in matters having a bearing, however remotely, with the practical details and management. It is hardly to be expected that gentlemen whose time and attention are taken up with other matters, or whose training and experience may have unfitted them for giving an opinion, should override the advice of their professional adviser without very substantial reasons. Cases may, and will, arise where a diversity of honest opinion exists, and when such should occur, it is no degradation to any one in having the matter under dispute referred to some gentleman of standing, whose decision will be mutually respected.

The relations to which I have thus referred necessarily involve the condition that fair remuneration be paid for professional services, whether as manager, engineer, or both; and here a question presents itself more easily asked than answered—viz., what is to be meant by fair remuneration? Although I feel myself unable to answer the question, or to lay down any general principle fitted to establish such a relation, there are some definite standards, or constants, that may be taken on which to base an approximation. The first of these is the quantity of gas made in millions of cubic feet; and, secondly, the quantity of coal carbonized per annum. In applying the last, the rule is to allow £40 as a minimum to £50 as a maximum, for management and engineering, upon every 1000 tons of coal and cannel carbonized. From my own experience, I have reason to think the estimate a fair one for medium-sized works having an annual manufacture of from 100 to 200 millions. In such cases the maximum rate thus given will be found to provide for management, engineering, and assistants. In the case of small works these limits may be considerably increased, and in large works considerably diminished. On this question our past president has given a very pronounced opinion, with a freedom and candour which I cannot but admire. He advocates the system of remuneration being dependent, to a certain extent, upon results—a principle which at the present day is being extended into many departments of the Government, to banks, and to many of the manufacturing and commercial industries in the kingdom. Mr. Livesey shows how such a principle may be applied to render the interests of the gas proprietors, the managers, and the gas consumers identical, and closes with the following judicious and pertinent remarks: "Payment by results would also prevent incompetent men from receiving more than their deserts; while, with competent men, it would tend more than anything else to retain them in the service of the company or corporation; it would give them a direct inducement to extend the business, since their pay would increase in proportion, and leave them without an excuse for yielding to the very plausible temptations to which they are exposed to increase their incomes by the acceptance of commissions."

I cordially agree with those sentiments; they are based upon a principle of equity mutually advantageous, and, so far as my knowledge extends, mutually satisfactory. In the application of such an arrangement between gas proprietors and their manager, I can anticipate no reason to doubt that it would prove satisfactory. "Like causes produce like effects, and from similar circumstances, similar circumstances ensue;" it is, however, proverbial that "great bodies move slowly," and probably some time may elapse before sufficient power is accumulated to overcome in all cases the *inertia* of established usages.

Without further enlarging upon this principle, which I have no doubt, if brought under the notice of the representatives of gas companies or corporations, would meet with consideration, I have reason to believe that any grounds for complaint of insufficient salary are comparatively few, and that, as a general rule, the managers of gas-works are fairly paid.* Encouragement in this way is not lost; and the expenditure is so immaterial in the outgoings of a concern, as to lead me to entertain a strong opinion that any reasonable increase of remuneration should not, *per se*, form an element for separation.

Sunday Labour in Gas-Works, and Labour-Saving Apparatus.

The question of Sunday labour in gas-works has occupied the attention of this association for some years past, and I understand at the present time there are several companies who have suspended all labour in the retort-house during the twelve hours day shift. While admitting the propriety of not encroaching upon the Sabbath as a day of rest, and that the working man should not be required to continue his process of toil from week to week, without any cessation save that required for restoring nature in rest and sleep, there are necessities in operation which frequently overcome our best intentions, and render them of a purely negative kind. Such is the bearing which the question before us assumes. In the great majority of cases, it is not one simply of Sunday labour, or non-Sunday labour, but involves the further consideration of increase of capital to a material extent, simply upon the ground that work may be suspended on that day; the question, therefore, is one that practically resolves itself into a matter of expediency; and, in my opinion, any gentleman who might be disposed to push it beyond that point, however well-intentioned his motives, might not benefit the cause he wishes to advance. I think it more than probable that both proprietors and engineers of gas undertakings would hesitate to expend capital which afforded nothing in return except the doubtful advantage of reducing Sunday labour.

The question of labour, however, involves considerations of a more general and comprehensive kind; and such is the importance with which the subject is invested, that I feel no apology to be needed in bringing the matter under your notice, forming, as it does, an element of such magnitude in the expense of manufacture as to merit the special attention and consideration of the manager. In looking at the gigantic industry of this country, and comparing it with its small population, we are presented with results to which the world has no parallel. By the economizing of labour, we have accumulated an amount of power which is variously estimated, but, taken at the lowest approximation, will probably represent the labour of five and a half hundred millions of able-bodied men in a population of something under ten millions. This vast accumulation of power is the great source of the material wealth and prosperity of this country; and, at the present day, we have satisfactory evidence that capital is increasing, by the extension and widening of old, and the opening of new, channels of enterprise in a much greater ratio than that of the increase of population. This disproportion is still further augmented by the prevailing but mistaken idea that the labouring classes meet with a better reward in foreign countries, the delusion being fostered by interested parties, and year after year adds to its thousands who emigrate from this country under promise of benefits which are rarely, if ever, fulfilled. The question, therefore, of the further extension of mechanical power, in its application to the various processes of industrial manufacture, cannot fail to force itself upon the consideration of the employers of labour. Amongst the most important of the industries of the present age is gas manufacture, which employs in Great Britain and Ireland a capital of about £130,000,000 in works and plant. In such establishments about 80 per cent. of the labour employed in the process of manufacture is expended in the retort-house. To this point the attention of engineers is very properly directed, forming as it does the chief element where further economy is capable of being introduced. During the past few years, a series of well-directed efforts have been made to reduce the cost of labour by the application of mechanical arrangements to the charging and drawing of retorts, which, though probably not so successful as could be wished, is the

* See Journal of Gas Lighting, vol. xxv., p. 754.

* Circumstances have transpired during the past year which lead us to believe there are exceptions to this rule, in the case, at least, of two towns in Yorkshire, whose economical views, it is hoped, will be avoided rather than imitated by others.

introduction of a system right in itself, and which, in my opinion, will be employed at no distant period in many, if not all, the important works in the kingdom. In the present stage of these applications, our duty is to pay our tribute of respect to those who have been instrumental in leading the way, and to a considerable extent in triumphing over the difficulties which beset the application of machinery in that direction. Progress towards higher degrees of perfection in all labour-saving machines, is necessarily slow. The steam-engine is not the creation of yesterday, and although even at the present day its hidden powers are only partially developed, and much remains to be done before the absolute potential energy locked up in a pound of coal can be liberated and utilized as a moving force, the success already achieved gives reason to encourage the hope that mechanical power, as at present applied to stoking, will not be exempted from the improvements which the application of time and industry is calculated to call forth. I do not know how far I am right in thinking it probable that the desire to make the machine perfect by the adaptation of arrangements for lifting and measuring or weighing the coal, and drawing the coke, is attempting more than might be desirable, as these operations involve a considerable amount of capital in machinery, with doubtful corresponding advantages. Filling the scoops and drawing the retorts are operations that may be performed by a common labourer, probably nearly, if not quite as cheap, and with less risk of injury to the retorts. There can be no doubt the expense has acted as a barrier to their more general adoption, and I cannot but think the application of a steam-engine of 6 or 8 horse power to accomplish the work of two men is out of proportion of means to ends. In making these observations, I probably lay myself open to the censure of some of my friends; my object, however, is not to depreciate any of the present appliances, but simply to inquire, in the general interests of our profession, as managers and engineers of gas-works, whether it might not be desirable to confine the stoking machine to stoking only, without being encumbered with other appliances, the results of which may be of doubtful utility. In the event of drawing machines being preferred to hand labour, it is desirable there should be separate machines for that purpose, the one following the other in regular succession, which avoids confusion, and ensures a system of regularity and order which cannot be attained by the double combination.

It would be invidious on my part to recommend any machine in preference to that of another, but, in all honesty, I am disposed to think that which best fulfils the requirements of a machine of this kind is to be found in the hydraulic stoker of Mr. Foulis, which has been in use for some time at the Rochdale Road Gas-Works, Manchester, and which has been found satisfactory. The space on each side of the retorts is 20 feet, which is sufficient for the machines travelling, of which there are two on each side—viz., one for drawing and another for charging, the respective operations of which accomplish at the rate of about 58 retorts per hour.

The *direct* advantage gained by the use of this machine over that of others is a question on which I feel myself incapable of expressing an opinion; *indirectly*, by the use of water the retort-house is kept at a moderate temperature by the refrigerating influence of the water, while, in the case of steam, the temperature is considerably increased, and the waste steam in a combined engine and stoker interferes materially with the progress of the work. On the other hand, I should be disposed to think the application of steam more economical than that of water, the consumption and waste of the latter being very great. No doubt, with a proper system of channels and filtering, so as to prevent any particles of coke being carried into the reservoir, and thus destroying the action of the pumps, water may be utilized, and used over and over again. The objections which apply both to steam and water, whether as to their cost or concomitant results, would probably be removed by the application of compressed air as a motive power, and I think it not improbable the improvements of the future will assume that direction. Since our last meeting, two machines have been brought under our notice, the first being the patent of Darlington and Scott, described and illustrated in the JOURNAL OF GAS LIGHTING (vol. xxiv., pp. 170–172), but of which no further intelligence has reached me. This machine is on the combined principle, by which both the charging and drawing are accomplished. The objection liable to be raised against it, and which appears to me a serious one, is the weight of the engine and boiler requiring to be moved to and fro with the frame in every projection of the scoop or rake.

The second is the patent of Messrs. Warren and Wates, which is simple in its combination and arrangement, and in which many of the defects incident to the earlier machines have been avoided. As this machine forms the subject of a paper to be read by Mr. Warren, any description here will be unnecessary.

The Inventions and Improvements of the past Year.

This leads me to bring before you a few of the more important improvements that have taken place during the past year in the process of manufacture and measurement, &c., of gas. In the order of sequence, that which claims our first attention is the arrangement of Mr. Spice for the production of his "compound hydrogen gas," which is described and illustrated in the JOURNAL OF GAS LIGHTING, vol. xxiv., p. 277. The object contemplated to be gained, and for which his apparatus appears to be particularly well adapted, is the manufacture of hydrogen and other gases from the decomposition of water, and which are subsequently enriched by their admixture with cannel gas, the vapour of petroleum, or of other substances which yield hydrocarbons in their distillation. It is unnecessary to say the manufacture of gas from water is no new invention; so early as the year 1824 a patent was granted to I. H. Ibbotson, who describes in his specification a "decomposing chamber" placed over the furnace to be filled with coal or coke, into which steam is admitted either alone or in combination with oil. The next in order was that of J. B. Mollerat, who in 1834 proposed to utilize the vapour from coal tar, naphtha, petroleum, asphaltum, and bitumen, to render luminous the hydrogen and carbonic oxide gases, produced by the decomposition of steam over red-hot charcoal, and to mix the gases in their passage to the gasholder, or in the gasholder itself. This was followed in 1838 by the patent of Hyppolite F. Montauban, who sought to manufacture gas from oils, resin, tar, and other matters in combination with water or steam. In 1839, Alex. Cruickshanks patented a process for saturating small coal with tar, and when charged into the retort a jet of high-pressure steam was introduced. In the same year De val Marino brought out an improved arrangement for the manufacture of water gas, and in order to effect a more perfect mixture of the gases before leaving the retorts, he proposed to use three; water was allowed to flow into the first, from which the steam passed into the second, and finally through the third, which was supplied with tar. Such is a brief outline of the earliest application in the manufacture of water gas, and the absolute failure of such crude attempts excites in us no surprise. The next patent of any importance was that taken out by Mr. Stephen White of Manchester in 1847, for the manufacture of his "hydrocarbon gas," who entered much more practically and carefully into the matter than any of his predecessors had done, but with what amount of success is known to all of you. Since that period numerous patents have been taken out both in this country and America, with equally unsuccessful results.

Spice's Apparatus for the Production of Hydrogen and Carbonic Oxide.

We now come to the patent of Mr. Spice, whose apparatus for effecting the objects sought assumes a vastly superior aspect in his practical hands, whether as to arrangement for carrying on the process of manufacture in a safe and economical manner, or the chemical combination of the process. Hitherto the chief cause of failure in the carbonizing of hydrogen gas has arisen, I apprehend, from two causes—first, that of imperfect methods of construction; and, secondly, imperfect materials for carbonizing. These deficiencies of former operators appear to have been successfully overcome through the skill and capacity of Mr. Spice, whose works at Wormwood Scrubs, for supplying with gas the stations of the Great Western Railway Company, the Great Western Hotel, and other places, appear, from the evidence of a report addressed to the chairman and directors of the gas company, not only to be satisfactory, but highly favourable to the working. Thus, for the week ending Dec. 13, 1874, the gas made was 254,100 cubic feet, employing one bench of six retorts, and two men, the net cost of the gas being thus stated—viz.:

	£	s.	d.	Per 1000. s. d.
Petroleum used, 703 gallons, at 8d. per gallon .	23	8	8 = 1	10·14
Labour, at 35s. per man	3	10	0 = 0	3·30
Breeze, 11 tons 19 cwt., at 1s. 6d. per ton . .	0	18	0 = 0	0·85
Wear and tear, estimate based on six months working of the apparatus		—	0	3·00
Net cost		—	2	5·29

Week ending Dec. 30 the gas made was 270,000 cubic feet, employing the same retorts and men—

	£	s.	d.	Per 1000. s. d.
Petroleum used, 776 gallons, at 8d. per gallon .	25	7	4 = 1	10·99
Labour, 35s. per man	3	10	0 = 0	3·11
Breeze, 12 tons 2 cwt., at 1s. 6d. per ton . .	0	18	0 = 0	0·80
Wear and tear, as before		—	0	3·00
Net cost		—	2	5·90

The cost, therefore, delivered into the gasholder, is shown here to be 2s. 6d. per 1000, which, in round numbers, is 6d. per 1000 for gas, and 2s. for carbonizing it. This statement, favourable as it is, appears to have been made under somewhat unfavourable circumstances, as the petroleum then used was not the normal quality of that generally employed, and, for equal quantities of gas, yielded an illuminating power of from 15 to 17 candles instead of 22 to 25 candles, a difference by no means inconsiderable; for, if we take gas at 23 candles, and bring it down by dilution to say 16 candles, the volume will be increased to about 2000 feet, and the cost to 3s., or 1s. 6d. per 1000 for 16-candle gas. Comparing these results with similar sized works for the distillation of coal, in which 8-feet retorts are generally used, the proper charge for which would be 1½ cwt. of coal, and, at 6-hour charges, would produce a weekly make somewhere about 119,000 cubic feet, while Mr. Spice produces more than double this quantity, with equal carbonizing space. It may become a question of importance, as affecting the cost of production, whether the more extended use of Mr. Spice's process would not proportionately influence the price of petroleum, and America would naturally take advantage of the increased demand; but at present rates it certainly appears that, light for light, it can be produced cheaper than from coal and cannel.

Mr. Scott's Process for Distilling Coal.

An arrangement for the setting of retorts and the manufacture of gas formed the subject of a paper read before the meeting of the West of Scotland Association of Gas Managers, by Mr. Scott, of Musselburgh, which deserves more than a passing notice. The paper is printed and the arrangement illustrated in the JOURNAL OF GAS LIGHTING, vol. xxiv., p. 94. Mr. Scott places his retort vertically in the oven, and which from time to time receives a new charge of cannel at the top, by which means the temperature at this part is kept considerably lower than the under portion, evolving in its distillation probably something more than the normal quantity of liquid hydrocarbons; but, as the temperature increases towards the bottom of the retort, the volatile oils in combination with tar and nascent gases become further decomposed in their passage through the higher temperature of the previous charges before they reach their exit, which is placed near the bottom of the retort. The main features of this process are similar to that of the patent of James Young, taken out in 1854. In his specification, after describing the process of the destructive distillation of coal, and that the products of tar and liquid hydrocarbons consist mainly of the same elements as the gas itself, he proceeds to describe his method of utilizing them. "I set (he says) the retorts vertically in the oven, &c., and I cause the coal with which they are charged to descend slowly and continuously from the upper to the lower end of each retort, and be there discharged in the state of coke. I also place the passages of the exit of the gas at or near the lower end of the retort, in order that the hydrocarbon vapours formed in the upper part may be exposed, in passing to the outlet, to the higher temperature of the lower parts, and be thereby converted into permanent gas before they finally pass off from the retort." It is, perhaps, desirable to notice that the conical retort is an old invention, for which a patent was taken out in the year 1828 by John Brunton, for the very doubtful "improvement of facilitating the discharge of coke at the large end, when fixed in a vertical position with that end downwards." Mr. Scott, however, is more practical in his application of a conical retort, as his object is doubtless to provide an increased area for the purpose of the more effective decomposition of the crude oils in their passage through it. His method for closing the mouth of the retort by a turned valve and seat, and for discharging the coke, are equally improved arrangements.

The various devices to compass the object sought to be attained by Mr. Scott have, as a rule, assumed the more general aspect of causing the products of distillation from one half of the retort to pass over the heated surface of the coke in the other part, or they are passed into separate retorts for that purpose, the disadvantage arising from such applications, and which probably contributed in no small extent to rendering such a course impracticable, was the ever recurring stoppage which took place in the ascension-pipes. This contingency is said to be overcome by Mr. Malam, of Dumfries, in having a jacket or trough cast upon the mouthpiece, which is filled with water, and acts as a refrigerator in cooling the temperature of the products as they leave the retort. So far as I can judge, this is the only novelty connected with his patent, as the spray of water trickling down the ascension-pipe has, within my own knowledge, been applied 28 years ago, while the main features of his process are, in effect, precisely similar to that of Basford's double or twin retort of 1857.

Basford's patent was almost identical with Salmon's of 1855, who used one retort for the distillation of coal, and another side by side for decomposing the products. This again was an imperfect imitation of Murdoch's patent of 1845, for causing the products of distillation to be carried "through tubes maintained at a cherry-red heat for decomposing and converting into gas the tar and essential oils combined therewith." The patent of Murdoch, however, was only a modification of John Grafton's, obtained in 1841, in which he (Grafton) used double retorts of fire-clay wrought with an exhauster, the products of distillation being passed through a "decomposer," either detached or in combination with the retort. Again, Grafton's patent was doubtless based upon the arrangement of Messrs. Lowe and Kirkham, in which the combination of the products alternately of one or two retorts was made to pass into and mix with the products of the other retorts, &c., for which a patent was granted in 1839; and lastly, the germ of this patent will be found in that of Hyppolite Montauban, obtained in 1838, who was the first to attempt the decomposition of the liquid hydrocarbons in the distillation of coal.

Time does not permit my going more fully into this matter, of which I take leave by expressing my belief that in the distillation of cannel coal, or coal and shale rich in oil, the process of both Mr. Scott and Mr. Malam places

a power in the hands of the manager in considerably augmenting the volume of gas, without any undue deterioration of quality; but whether such processes can be beneficially applied in the case of common coal is a question on which a difference of opinion exists.

Substitutes for the Hydraulic Seal.

Several appliances have been made during the past year for the removal of pressure from the interior of the retort, none of which, so far as I can see, accomplishes the objects sought to be attained, as a pressure must necessarily exist in the interior of the retorts for the purpose of working the respective apparatus attached to each dip-pipe. In this respect I can see no advantage to be gained over the much more readily applied method of regulating the dip over the entire range of the hydraulic main by a chord of an arc in a face-valve placed on the exit of one or both ends. Any system, to be satisfactory, must be positively free from danger in the event of any derangement of the engines or exhausters, when it not unfrequently occurs that a heavy back pressure has to be encountered. My object is not to discourage the praiseworthy efforts made in that direction, but rather to encourage such efforts, by drawing attention to the points desirable to be avoided in such applications.

Purification.

Though nothing of much importance has transpired, during the past year, on purification, the subject is one of too great importance to be passed over without directing attention to it, and which of all others that fall within the range of gas manufacture is probably the least understood. The chemical changes that take place in the process of purification are complicated and conflicting even to an experienced chemist, and, as a general rule, gas managers are at sea in dealing with such complex combinations. Were it otherwise, they can ill afford the time to be spent in a series of experiments to reconcile discordant results by tracing the process of those changes. We are, therefore, dependent to a considerable extent upon the operations of the practical chemist in solving many of the problems which appear inexplicable, even to an accomplished engineer. This association will always be ready to acknowledge merit in the discovery of new and improved processes, and, to the honour of Mr. Patterson, one of the late metropolitan referees, it may be said, without exaggeration, that his monograph on "Purification" is the most valuable contribution to the science of gas lighting that has been made for many years, as eliminating from a chaotic mass of facts the why and the wherefore of cause and effect in the various processes of gas purification, and deserves the careful study and consideration of all who are interested in this matter.

I must deny myself entering into details, and to observe briefly that Mr. Patterson's method of liquid purification, by the use of decarbonated gas liquor, belongs to our respected past president, Mr. Livesey, for which a patent was obtained in 1865. Mr. Livesey's process, in decarbonizing the liquor, was different from that adopted by Mr. Patterson, but the results in both cases are very nearly the same. The object sought to be attained is to lay hold of the lesser impurity and make it subservient to the removal of the greater, and on this point Mr. Livesey's knowledge is clear and decided. In adverting to the application and failure of his process in his inaugural address last year, he was too modest to ascribe to himself the honour of the application, which all will admit he was the first to apply on a large scale.

The process of liquid purification is fraught with important results, and although I am disposed to doubt whether, in point of economy, purifiers will ever be entirely superseded, it appears quite possible to relieve them from a large amount of duty in a more economical way than in their further extension. It is gratifying to know that an infinitely more able exponent of the system than myself has consented to favour us with a paper on the subject at this meeting, which renders any further remarks from me superfluous.

In lime purification, I venture to say we have no better authority than Mr. Geo. Anderson, whose comprehensive knowledge of the subject is founded on something beyond mere guesswork, the accuracy of which appears to me to be practically confirmed by the technical researches of Mr. Patterson. For many years past, Mr. Anderson has not only advocated, but practised the principle of continuing the use of his first series of purifiers as long as possible, after their action for the removal of sulphuretted hydrogen has ceased, in order that the carbonic acid, which will continue to be absorbed by the lime, may displace the sulphur and drive it forward; the gas being thus purified from its carbonic acid in the first series of purifiers, the lime becomes converted more or less into the state of carbonate, and, as such, inoffensive in its removal. The second series of purifiers has only the sulphuretted hydrogen to remove, which, in the absence of carbonic acid, is attended with no difficulty. In this series of purifiers, the lime becomes gradually converted into sulphide of calcium, which Mr. Anderson some years ago suggested as the best agent for the removal of the bisulphide of carbon. So far as I can discover, this does not differ in any degree from Mr. Patterson's process by lime; but that gentleman is the first to point out, and clearly trace, the important *rôle* played by carbonic acid in the various processes of purification, and the first to turn it to a profitable account as an active and valuable agent in the process.

In connexion with the subject of purification, it is worthy of notice that Messrs. W. and C. Walker, who have long distinguished themselves for excellence of workmanship in the construction of gas apparatus, have adopted the more perfect system of planed and surfaced joints in the construction of their purifiers—an improvement we hail with satisfaction. The antiquated iron cement joint has only been tolerated on account of its cheapness, but this discredit to modern engineering has been overcome by the enterprise of this firm, without adding to the cost of the apparatus.

Improvements in Meters.

I dare say it is well known to gas engineers that there are two elements on which the success or non-success of gas manufacture, in a commercial point of view, depends. The first is to realize the maximum production of gas from the coal carbonized. The second is to sell it. There is, however, between the gasholders of the manufacturers and the burners of the consumers, interposed a series of causes which operate, to a greater or less extent, in reducing the quantity paid for, as compared with the quantity made. It would be superfluous on my part to enumerate these causes to practical men. I shall, therefore, confine myself to the question of measurement, which, of itself, is probably the least of the causes to which I have referred. Since the passing of the Sales of Gas Act, the construction of the meter has attained to a degree of accuracy in its measurement not by any means unsatisfactory; for, although its liability to error has not been quite eliminated, yet, so long as the annulus of the measuring-wheel is maintained without any great variation in the water-level, the instrument is practically correct. There are, however, degrees of what may properly be termed excellence; and this leads me to notice one of the most beautiful applications which science has yet devised in the construction of the meter, and which has rendered it an absolutely reliable and unvarying instrument. This improvement, of which any one might be proud, is due to the analytical mind of Mr. Warner, of South Shields; and it is not too much to say that his ingenious device gives evidence of a thoroughly correct knowledge of first principles, as its merits could only be discovered through the operation of inductive and deductive reasoning. The object aimed at, and most admirably accomplished, is to change the varying measurement of a varying water-line to an unvarying measure with a varying water-line and annulus. This application is, doubtless, known to all of you, and consists, as the model on table, of a supplementary drum, occupying about half the radius and half the depth of the ordinary drum, and is placed within its delivering chambers, forming an integral part thereof. The inlets of the supplementary drum are reversed, and they communicate with the outlets of the external chambers; the gas is thus remeasured and discharged, under cover, from the front outlets of the supplementary drum.

The *rationale* is this—that, as the annulus of both drums are above the water-line, any variation will affect both drums equally; its accurate measurement cannot be disturbed, whether by a varying water-line or a varying annulus.

The following are the results of a series of careful observations made upon a three-light meter, showing the mean deviation per cubic foot, under the different conditions named:—

Four Cubic Feet per Hour, 1-inch Pressure.

	Deviation per Cubic Foot.	Fast or Slow.
On water-line	0·010	Fast.
Water removed—		
4·32 cubic inches	0·014	,,
8·64 ,,	0·050	,,
12·96 ,,	0·060	,,
17·28 ,,	0·060	,,
21·60 ,,	0·057	,,
25·92 ,,	0·057	,,
30·24 ,,	0·055	,,
32·40 ,,	0·055	,,

Twenty Cubic Feet per Hour, 1-inch Pressure.

On water-line	Correct.	,,
Water removed—		
4·32 cubic inches	0·161	,,
8·64 ,,	0·150	,,
12·96 ,,	0·161	,,
17·28 ,,	0·172	,,
21·60 ,,	0·172	,,
25·92 ,,	0·170	,,
30·24 ,,	0·173	,,
32·40 ,,	0·165	,,

Twenty Cubic Feet per Hour, 2-inch Pressure.

On water-line	1·251	Slow.
Water removed—		
8·64 cubic inches	1·250	,,
17·28 ,,	1·134	,,
25·92 ,,	1·000	,,
30·24 ,,	1·008	,,

Twenty Cubic Feet per Hour, 3-inch Pressure.

On water-line	0·672	,,
Water removed—		
8·64 cubic inches	1·243	,,
17·28 ,,	1·250	,,
25 92 ,,	1·711	,,

Thus far the meter is proved to be highly satisfactory, and should the experience of a few years practical working sustain the expectations thus formed regarding it, it is likely to be brought into very general use.

Automatic Lamplighter.

An exceedingly beautiful and ingenious arrangement for the instantaneous lighting and extinguishing of street-lamps has been devised and patented by Mr. Green, engineer to the gas company, Preston; and Mr. Barrow, manufacturing chemist, Manchester. This little instrument differs from any application hitherto devised for this purpose, and any reduction in pressure during the night, or increase of pressure for manufacturing purposes in the morning; does not affect the lamps in the slightest degree beyond the reduction or increase in flame arising from the altered pressure precisely in a similar way as if the instrument was not used.

A brief description may for convenience be divided into—

1. That portion of the apparatus intended for turning on or shutting off the gas to or from the burner.
2. That part intended for communicating flame.
3. The part which is intended so to regulate the pressure upon the apparatus as to cause it to remain at rest until the pressure exceeds normal pressure.

The part of the apparatus for giving motion to all the rest is a small gasholder with elastic leather sides placed below the burner, called by the patentees the collapsible vessel. Attached to this vessel is a small wheel, notched or cut away on two opposite sides, and arranged so that at each quarter revolution the wheel will drop upon a rest or stop—first upon the outer circumference of the wheel, and next upon the notched portion. Inside the collapsible vessel, and in the direct course of the gas from the main to the burner, is a mercury valve; when the lid or cover of the collapsible vessel presses this valve down, the gas is shut off; and when the cover rises, the valve being free, it at once opens and allows the gas to flow to the burner.

Supposing that the lamps have to be lighted, pressure beyond normal pressure is put on, and the effect is to lift the upper cover of the collapsible vessel; this action frees the lid of the mercurial valve, and allows the gas to flow to the burner; at the same time the cam wheel, which is placed on the cover, is turned a quarter revolution, and, on the pressure being removed, the vessel collapses, until the wheel rests on its outer circumference, thus preventing the closing of the mercurial valve; a constant flow of gas is maintained until the lights require to be extinguished, which is accomplished in the same ingenious manner by putting on a slight excess of pressure when the expansion of the collapsible vessel turns the cam wheel another quarter revolution, and so soon as the extra pressure is taken off, the wheel falls this time upon its rest, allowing the collapsible vessel to sink to its lowest position, which, in doing so, closes the mercury valve, and instantly extinguishes the light.

The second part of the invention—viz., the means of communicating flame—consists in using chemical agents, such, for instance, as sulphuric acid and potassium chlorate mixed with organic bodies.

The sulphuric acid is placed in a small vessel near the burner, and the chemical agents, made up into the form of small pills, are contained in a long tube holding some 60 or more. The mechanical arrangement for liberating these globules is something like the shot-belt motion, and is worked from the lever of the collapsible vessel, a single globule being released and dropped into the sulphuric acid when the lamps require to be lighted, but the motion is prevented when the lights are to be extinguished.

The third part—viz., the regulation or adjustment of pressure—is arrived at by means of a water-lute of simple but peculiar construction. This lute is adjusted so that it prevents any gas from flowing into the collapsible vessel until a pressure is put upon the mains greater than the normal pressure. This extra pressure having opened the gas-way, is allowed to remain for about one minute; when removed to the normal pressure the vessel collapses, and the lid falls until it rests upon the cam wheel already referred to.

Probably reference to the working apparatus will give clearer views of the nature of this invention than any words of description; and as the patentees have provided, for the inspection of the members, a burner suitable for a lamp fitted with their apparatus in working order, it will be unnecessary to say more respecting it.

The patentees are, I understand, preparing to light up a small village, where they hope to be able to show the invention in actual operation.

Photometry.

In apparatus for photometrical purposes a constant and unvarying flame is still a desideratum. In this country, the sperm candle consuming 120 grains per hour is the standard unit. In France and Germany, the carcel lamp, giving an ethylene gas flame, is used. In either case, the amount of light during a series of experiments varies considerably, and, even with careful weighing, can only be regarded as approximations to the truth. A German gentleman has attempted to correct this uncertainty by the application of ordinary ether as the standard light. The cylinder in which it is contained being surrounded by water, which is heated by a jet of gas, and the flame from the ether is controlled to the quantity of light required by a micrometer screw.

This device will obviously not meet with many supporters, even though its accuracy as a constant flame could be established, which is more than doubtful. Assuming the standard light to be a gas flame, probably nothing can be more convenient or reliable than using coal gas for this purpose, which, in a series of experiments, I have sometimes adopted by passing the gas from a small gasholder through a governor, and reducing the flame from the jet until equal lights have been established on the photometer, with a sperm consumption of 120 grains per hour.

In connexion with this subject, it may be desirable to notice that the Corporation of the City of London, while promoting on the one hand the most objectionable democratic measures against the metropolitan gas companies, on the other it has suited its interests to be objectionably conservative. During the past year it has thought fit to take exception to the use of the "London" standard Argand, prescribed by the referees as the test-burner, under the singular charge "that it is quite unfit for general use," and "that it educes from the gas an illuminating power far beyond that which can be obtained by the ordinary burner."

How, or in what way, Sugg's improved Argand is unfit for general use I do not know. The plea put forward by the corporation is its liability to smoke; but this tendency is possessed by all burners alike, should their maximum consumption be exceeded under a low pressure. In this respect the improved Argand is certainly not more liable, nor, indeed, quite so liable, to smoke as the old Argand; and, from some experience of their use, I am prepared to recommend their general adoption where such burners are used, on the score of economy to the consumer.

In ascertaining the value of coal for gas purposes, it would obviously be absurd to maintain that the results produced on the large scale were the true measure of its value, as the results will be the value of the coal *plus* the imperfections incident to the working, which may vary to any extent. The proper way to arrive at its value is by adopting an apparatus of the most perfect kind, in order that the closest approximation to its true value may be determined, and to bring up practice as near as possible to that standard.

In like manner, it is manifestly absurd to attempt the reimposition of a positively false standard to the measurement of the light-giving properties of gas. The adoption of the old obsolete Argand would, in its practical results, be equivalent to altering the capacity of the Government cubic foot from 1728 to 1900 cubic inches, a proposition which probably will find few supporters beyond the Corporation of London. Practically, it is not possible, under the best applied conditions known to us at the present day, to obtain the absolute amount of light capable of being eliminated from coal gas, and the closer any approximation can be made by improved methods of combustion is a gain to science, and cannot be set aside on the ground that they provide the means for doing so.

For scientific purposes, a very pretty application of the carbon light has been made by a Mr. Day, of Ohio, which is said to be more constant, and to require less attention than the ordinary electric, or oxy-hydrogen lights, and on that account better fitted for illustrating scientific lectures. Mr. Day uses a thin narrow plate, or ribbon of carbon, covered by a glass globe, containing dry carbonic acid gas, which he suspends between two platinum poles with which the carbon plate is connected, and which, on receiving an electric current from the battery, becomes in the atmosphere of the gas brilliantly incandescent. The carbon is not consumed, and the heat liberated so immaterial as not to injure the small globe in which the ribbon is enclosed. It is not improbable this application to experimental science may prove more constant than the charcoal electrodes used for the electric light, which under the best known arrangements cannot be depended upon for any length of time.

Legislation as applied to Gas Manufacture.

During the past year there has been little done in gas legislation that calls for special comment. The socialistic bills promoted by the combined operations of the Board of Works and the Corporation of the City of London, by which they sought to be invested with power to erect competing works at the expense of the ratepayers, or, failing this, to have bestowed upon them powers to take compulsory possession of the works and plant of the respective companies, on the principle of the market value of the shares, were withdrawn by the promoters on learning from Mr. Secretary Cross that the Government would decline giving any countenance to the measures; and it is much to be hoped the prudent and conservative tone of the present Government will continue to interpose its authority for the conservation of the rights and privileges of companies established on the good faith of Parliament.

On this question I cannot but refer to the unwise, if not reprehensible conduct pursued on the part of corporations in employing some unscrupulous adventurer, whose duty it is to sow the seeds of animosity, hostility, and distrust in the minds of the population against gas companies, in order that the value of the property may be depreciated, with a view to the detractors becoming its possessors. Happily for the honour and *morale* of public bodies, this may be considered an exception to the rule, and where such an unprincipled attempt is put forward, gas companies can have only one course to pursue—that is, to stand upon their legal rights, to make no compromise of whatever kind, and to allow the law to be put in operation, and take its course by arbitration.

My object, however, in adverting to this matter is more for the purpose of considering the principles involved in the transfer than the propriety of it. I venture to think the market value of the shares is no criterion of the commercial value of the undertaking. I have no doubt cases may be found in which the application of this principle would double the nominal capital to the purchaser, while the absolute value of the property might not be worth more than the half. On the same principle there are other cases in which the market value of the shares would only give 20 years, while their absolute value may be over 30 years purchase. It is obvious, therefore, that to adopt the selling price of shares as the basis of the value of such property is quite fallacious. Indeed, no fixed principle can be laid down in such cases, as every company must stand upon its own particular merits, but any valuation, to be reliable and satisfactory, must, I apprehend, recognize the following elements, viz.:—

1. The state of repair and the general condition of the buildings and apparatus.
2. Their adaptation and efficiency, and whether the works, in part or in whole, are capable of meeting an increase in the manufacture without further extension of capital, and to what extent.

A careful determination of these conditions must necessarily underlie any process of valuation having a claim to accuracy. The results of such a survey leads us to the next stage of the process—viz., that of determining the number of years by which the profits of the concern, or, what is more constant, the dividends paid, shall be capitalized.

Contrary to expectation, the "Metropolis Gas Companies Regulations Bill" has passed its second reading, and is now in the hands of a select committee. The most objectionable feature of the measure was in its 6th clause, which proposed to fix a uniform standard price of 3s. 9d. per 1000 cubic feet, and that, for every penny charged in excess of such price, the dividend would be reduced by one-quarter per cent.—a clause so essentially unjust and one-sided as to be condemned both by the Chancellor of the Exchequer and the President of the Board of Trade, who requested its removal from the bill. The motives which actuated such an attempt at the ruin of the companies are not above suspicion, and must have left a very unfavourable impression of the honour and integrity of metropolitan government.

It will not escape the notice of the committee that the 49th and 50th clauses are also of such a nature that, if carried out in their present form, it would be a very unmeet violation of justice. They seek to repeal Acts under which large capitals have been raised and expended, and, if such a principle of confiscation be admitted by the Government, it is difficult to say where it may end. The clauses sought to be introduced into the bill provide that, after paying dividends (provided they can be earned), the excess (if any), to the extent of one per cent., shall be carried to an insurance-fund, and the remainder shall be applied in making a reduction in the price of gas. No provision is made for inadequate profits, the restoration of plant, or renewals of any kind which are constantly occurring. The screw acts only in one way, and the companies subjected to its influence would, in all probability, soon find themselves involved in difficulties from which they would have no power to relieve themselves. The sequestration of surplus profits from the reserve-fund for the equalization of dividends, without any substitution or equivalent, is a direct violation of the protection afforded to the respective companies, not only in their special Acts which define the dividend, but also of the "Gas-Works Clauses Act" (c. 30, 31, 32, 33, and 34), which defines the manner in which this fund has to be applied; a principle so obviously unjust, and so fraught with the elements of uncertainty to every class of property based upon Government authority, as to render it extremely improbable whether the Right Hon. W. E. Forster or the Government will suffer them to pass without such modifications as will remove their confiscatory tendency, or to withdraw them from the bill.

The admirable and valuable *résumé* which has appeared from time to time in the Journal of Gas Lighting, presents us with such clear and intelligible views on this and other matters, as to reflect high and deserved honour to the gentleman who contributes its "Circulars to Gas Companies." While temperate in their language, they are singularly comprehensive and correct in their conclusions. To these I must refer you for further information, and proceed to notice some points which justly call for a revision of the present laws.

The exceptional high price of coal during the past three years has occasioned much anxiety to the directors and managers of gas-works who have had the misfortune of being bound down under their Acts of Parliament to such prices as barely paid their dividends previous to the advance. Under such a state of things it is not to be expected, with coal and cannel at an average increase in cost of about 120 per cent. on the past three years, that the prices fixed in the special Acts can be much longer maintained, without many undertakings becoming involved in serious difficulties. No better illustration can be given of the fallacy adopted by the Legislature when dealing with special Acts, in drawing a hard and fast line for the maximum price at which the gas is to be sold, irrespective of the increase that may take place in the value of coal, cannel, wages, and other materials used in its manufacture. I do not question the honest intentions of the Government in introducing such a clause into these Acts, but I must decline to recognize their fairness in a commercial point of view. The price of coals, wages, &c., are elements which necessarily control the price at which gas can be supplied to the consumer, and the average increase in cost during the triadal period named has been equal to 1s. 4d. per 1000 cubic feet. To be just, the Legislature, in fixing the maximum price to be charged, based upon the normal prices of materials at the time, are entitled to give the same protection to the manufacturer as to the public, in the event of any material alteration being made on the value of the elements which enter into its cost. Such, indeed, appears to have been the intention of Parliament under the General Act of 1847, that gas companies should realize a fair trading profit. The 30th section of that Act recites, that "the profits of the undertaking to be divided amongst the undertakers in any year shall not exceed the prescribed rate, or where no rate is prescribed, they shall not exceed the rate of ten pounds in the hundred by the year on the paid-up capital of the undertaking, which, in such cases, shall be deemed the prescribed rate, unless a larger dividend be at any time necessary to make up the deficiency of any previous dividend which shall have fallen short of the said yearly rate." The 31st section goes on to say that in the event of the profits exceeding the amount of dividend, the surplus is to be invested in a reserve-fund to meet any deficiency in future dividends, or extraordinary claims that may arise against the company. These provisions being incorporated with all special Acts, it is difficult to reconcile the apathy of the late Government to redress a grievance so oppressive in its operations, and so unconformable to the spirit of its intentions. In this respect it differs little from that of binding a man to a log of wood, and sending him adrift either to sink or swim, without any further sense of care or solicitude. This is not the course we have reason to expect; the mission of a Government consists, in part at least, to maintain the legitimate interests and property of all classes, and to redress the wrongs of previous legislation when they are found to exist.

Many companies, owing to the close margin between dividends and profits, have not been able to set aside any considerable sum as a reserve, and in numerous cases the fund became exhausted during the first year of the advance in coal and cannel. The amendment bill of 1873, introduced into the House of Lords by Lord Redesdale, was designed to give limited relief by affording access to the Board of Trade to obtain such temporary alterations in the special Act as the board might think fit to grant, but in every case at a considerable sacrifice of the applicants interests. When these clauses were drawn up, the belief was generally entertained that the then excessive high prices of coal and cannel could not be maintained. This opinion has not been well founded, for although the inferior class of coals has considerably receded from their highest point, the difference on gas coals and cannel is not nearly so great, and the probability is that prices are permanently advanced greatly beyond their previous rates in 1872. The clauses introduced by his lordship, confining the application of the Act to two years, and limiting the dividends to a nominal amount, were probably founded upon the general assumption that things would revert to their normal state within the time specified, and have thus proved a signal failure.

In almost all gas companies the share list is found to contain a number of widows, who in some cases had invested their all; these generally having purchased at prices which yield them the modest sum of 4½ to 5 per cent. on their investment; to such the present state of things is simply ruin.

The Legislature might be disposed to say, "You have obtained your special Act, and you were willing to undertake the responsibility of the conditions imposed in its clauses." True, but those conditions have become entirely altered through causes beyond the control either of the company or of Parliament, that it is not only difficult but in some cases impossible, in a commercial point of view, to fulfil those conditions under the abnormal state of things which now exists. It may reasonably be asked, is it fair or expedient, under circumstances so materially changed, to decline to afford relief. The under-

takers in concerns of this kind, sanctioned under an Act of Parliament, are as much entitled to a fair interest on their capital as the landowner is entitled to his rents from the farming of his land, and there is nothing antithetic with the intentions of the Legislature in seeking to be placed in a position relative to that which existed when the special Act was passed. It is not for me to say how this should be done, but probably the course most convenient for all parties would be to pass a general Act, with such clauses as would afford relief, under the supervision of the Board of Trade.

Another subject to which I venture to direct your attention, as urgently calling for the interference of Parliament, is the

RATING OF GAS-WORKS.

In the rating of gas and water works for the relief of the poor, no system could be more unsatisfactory, or more inequitable in its operation, than the course adopted in dealing with this class of property. The devious courses pursued in arriving at the rental of the assumed yearly tenancy, show the exceptional and imperfect state of the law in its relation thereto. In cases where companies are struggling under difficulties, and unable to pay more than a fractional dividend, or none at all, the principle of structural value is adopted, and the amount of rental fought on that basis. This certainly is the true principle of rating, and doubtless the one contemplated by the Act of Parliament. There is no difficulty in its application, and few grounds for complaint can arise from its operation. Unfortunately, however, the law has given countenance to another mode of valuation invidious in its application, and most unhappy in its results. When companies are well managed, and paying their maximum dividends, structural value is ignored, and the rating is based upon the profits of the concern, irrespective either of the state of the property or the capital invested in the undertaking.

My object, however, is not so much to raise the question whether the principle of rating should be based upon structural value or on commercial profits, as to point out to you the unfair application of the law as now applied to gas and water undertakings. If the basis of valuation is to be made upon the profits of the undertaking, it ought to apply to all commercial concerns alike, otherwise it cannot be a sound one. It is impossible to recognize any principle of equity in singling out gas companies, and rating them upon trade profits, while iron-works, chemical works, and indeed every other branch of commercial manufacture is exempted and rated upon structural value. I can conceive of nothing in the buildings or machinery of any kind connected with gas-works which would justify a different method of treatment to be applied, unless with a view to assess profits.

The plea put forward is, that though profits may not be regarded as the measure of value in estimating the rental for yearly tenancy, it is necessary that the profits be known, and that, by making certain deductions, the annual value of the holding to a tenant is more easily defined.

It is well known to the profession that the practical effect of this mode of valuation is to convert the assessment for the relief of the poor into a tax upon industry of the most objectionable kind by the rating of personal profits, which was never contemplated by the Act. The rateable value of a concern has no relation whatever to the profits of trade. The criterion is, what a tenant will give from year to year, that will enable him to invest his capital in working it, and make a fair profit as the fruits of his industry. The recognition, however, of a principle, limited, it may be, in its operation, generally outgrows the primary limits to which it was confined. Such is the case with the legal sanction that profits form indirectly the means of estimating the assessable value of gas-works; and, as a proof of the manner in which it is abused, I have only to present you with a recent case in which I was concerned, where a re-valuation of the works for the relief of the poor was made in 1870, which resulted in an increase on the assessment of 28 per cent., being about 25 per cent. in excess of the fair assessable value. Not satisfied with such an increase, in 1873 a further addition of about 14 per cent. was added, simply upon the grounds as stated by the Assessment Committee, that "the profits of the company had increased." The capital expended during the intervening period was under £20. A more glaring case of the rating of personal profits, and the abuse of power under an assumed legal sanction, I have not met with, though probably it is not an isolated one; and, in the interest of gas undertakings, it would be desirable to memorialize the Government for a revision of the law, and the application of a more equitable system of rating to this class of property.

COALOWNERS *versus* MINERS.

I cannot close these remarks without adverting briefly to the urgent necessity of legislative interference in the coal trade. The close relation which exists between coalowners and the great industries of this country is a question of grave import, as affecting the stability and the future of these undertakings. The past four years have presented us with a state of things calculated to paralyze, if not to permanently injure, the material prosperity and mercantile enterprise established in this country. The proximate cause of these evils may be briefly summarized as a war of labour against capital. The extensive combinations of miners, formed into a powerful union, have taken advantage of their position to form a widespread combination of strikes, in order to compel from time to time a large increase in their rate of wages, and to resort to the same dishonourable means in resisting every attempt at reduction. The operation of this compulsory conduct on the part of the miners has led to a similar combination amongst the coalowners for their mutual protection.

I do not enter upon the abstract question whether workmen are justified in combining, within certain limits, to strike for the purpose of enforcing higher rates of pay, or whether coalowners are justified in combining to take advantage of these strikes in turning them to their own benefit and profit. My object is simply to direct attention to the unsatisfactory condition into which this branch of our national industry has drifted, and to inquire, in the interests of the public, whether a remedy could not be applied to correct the evils under which we are made to suffer.

The arbitrary and reprehensible conduct which has guided the operations of the miners has led to an advance in the price of coal certainly far exceeding the advance made in wages. This, to some extent at least, may be regarded as the result of cause and effect, as the owners can urge the plea that they are justified in making an excessive charge, in order to cover the risks to which they are continually exposed.

It is impossible to deny that the whole of our coal industry, in which so many interests are involved, and with which the commercial prosperity of this country is so closely allied, has for some time past, and continues at the present day, to be based upon expedients and compromises, in which everything connected with them is uncertain and unsatisfactory. The miners, as a class, are too illiterate to estimate the cost by which their unwise policy is compassed, or to take any comprehensive view of the question beyond that of large pay and little work; and it is much to be regretted, in the mutual interests of all classes, they have, to a large extent, compromised themselves under the power of a few demagogues, who find it more profitable to keep up a state of chronic excitement, distrust, and hostility against the employers of labour than to put forth their hands and work. The ill-conditioned advice that the employers are their enemies has effectually wrought its work, and their dupes vauntingly boast they will compel by force that which is denied them by right, and even proclaim the Government powerless to interfere, or to prevent their acting as they themselves may choose. The future, therefore, presents us with aspects not more reassuring, and calls for some salutary restraint to be put in operation.

Notwithstanding the magnitude to which these evils have grown, it is not improbable the prevailing opinion of the present day may be adverse to any governmental interference so far as to determine the cost of produce, and the wages that should be paid, as infringing too closely upon the liberty of the subject. Abstractly considered, these views may be right, but extreme and exceptional cases require extreme and exceptional treatment. It must not be forgotten that liberty, like property, has its duties as well as its privileges, and that when exercised beyond the limits of prudence, and subversive to the common well-being of society, it becomes a matter of necessity that a power of restraint should exist, reaching not only to the question of wages, which of itself would be insufficient, but also to the hours employed, and the output of coal. Should the Government decline to interfere, the country must continue to submit to the injury, and the only course left is for employers to unite and follow the example of the iron and coal owners in South Wales, in vigorously meeting combinations by combinations, and opposing force to force. It is a matter for deep regret that such a course of conduct should be required, but the experience of the past three years has taught a lesson which no employer of labour can afford to disregard.

CONCLUDING REMARKS.

In conclusion, I venture, at the risk of being charged with presumption, to say a few words to the younger members of the profession. The science of gas and water engineering, which forms a distinguished part of the more general and extensive science of the civil engineer, has now risen to a position of great importance, and occupies no inferior place in the operations of that learned profession. It will hardly be necessary to say that it is of very recent origin, and first came to be recognized when capital had accumulated to such an extent that a greatly increased development of industrial enterprise should divert it into new and more productive channels; but the capitalist not possessing the necessary qualification for conducting and carrying on such undertakings, and who could probably occupy his time to more advantage in another way, employed skilled tradesmen to erect, superintend, and carry on the work. Bacon says that "every accession which man gains to his knowledge is also an accession to his power, and extends the limits of his empire over the world he inhabits." The practical knowledge gained by the early pioneers of the profession invested them with new power, gave new impulse to their thoughts, and widened the channels of investment by the discovery of new truths and diversified appliances for carrying them out, which the capitalist would not have dreamed of. The works of such men as Brindley, Telford, Rennie, and Smeaton, whose great undertakings, and the successful results achieved by them, lends no countenance to the assumption advanced by some gentlemen, that to be a professional engineer he must be acquainted with the whole range of physical science. I am not insensible to the benefits conferred on the profession through the instrumentality of science, and to the gas engineer there are some branches absolutely necessary; but all the sciences combined will not compensate for the want of business habits, care, and economy in the management of works, sagacity and judgment in the control of workmen, the originality which suggests expedients in the case of necessity, and the clear head which can draw up a specification, and understand the obligations between man and man in carrying it out, are faculties which science does not confer, though highly important to the successful gas manager. They were possessed, in an eminent degree, by the old self-made unscientific engineers, and in virtue of them became what they were. Thus unscientific men may, and do, become eminent in their profession; but I must further say that scientific knowledge makes the eminent man more eminent. The profession is not held in check, but guided, by science. Its streams do not poison, but quicken, intellectual life, and common sense will not suffer at its hands. Originality is not weakened by accurate conclusions being arrived at as the result of cause and effect. The clearest head is strengthened by scientific knowledge. Like the lamp of Aladdin, in the Eastern tales, it reveals the mysterious laws of nature, and brings to light their hidden treasures of gold.

The universal application of science to industrial manufactures is working marvellous changes over the civilized world, and leading to competition unparalleled in its history; nor is gas manufacture exempted from its general influence. No manager can safely decline to take advantage of every benefit it can bestow in improving its manufacture and extending its use, without falling behind the requirements of the age.

Without going into particulars, or wasting your time with trivial details, I venture to enumerate a few of the branches which are at least desirable, if not indispensable to the gas engineer. Of these, mechanical science, in its diversified bearings, holds the most distinguished part, as it furnishes to us the agents with which we work. Without *statics* we should be unable to determine correctly the best form of apparatus and structures, the material of whatever kind to be used, their mode of construction, and the strains upon any particular point. Without *dynamics* we are unable to determine the power of mechanical agents, or the most economical method of producing that power, and in the transmission and regulation of motion. A knowledge of mathematics is necessarily implied in mechanical science, as almost every process of the engineer involves calculations of some kind, and, therefore, forms an important part of his education. A knowledge of chemistry and mineralogy is also desirable, in so far at least as they are susceptible of practical application in determining the quality of the products of distillation, and the materials, of whatever kind, to be employed in structures.

The difficulties presented to the young engineer should not deter him from the resolution of triumphing over them; there is nothing within the range of those sciences which a little patience and well-directed effort will not overcome, and he will reap the benefit of such application in his future operations. It is only about three-quarters of a century since gaslight replaced the more ancient and primitive mode of lighting, and within that brief period is comprised the sum total of our knowledge on a subject which forms one of the most important branches of applied science. Great indeed are the improvements which from time to time have been introduced into its manufacture, and the laws which govern its distribution are tolerably well known; but, with all our boasted intelligence, we are only as yet groping our way on the threshold of our profession, and, humiliating as it may be, the oldest and most experienced amongst us is compelled to confess that, after a life spent in enthusiastic study and devotion to the science, he is only beginning to learn how little he knows. Science allows no Alexander to weep that there are no more fields to conquer; its kingdom is inexhaustible, and will so remain. In the language of an ancient bard:

> The faire lamps from whose celestiall ray
> The mental light proceeds,
> Shall never be extinguish'd nor decay;
> For when the vital spirit doe expyre,
> Upon its native planet shall retyre;
> For it is heavenly borne and cannot die,
> Being a parcel of its purest skie.

There is yet a great field before us to be cultivated by the industry of the future, and the widening sphere of vision may reveal new discoveries in the production of artificial light far transcending the best applied efforts of the present day; and every new effort, every new application of the divine gift of thought, is so much added to the power and influence of mind over matter. The present duty, however, which each of us is called to perform is to use the knowledge we have gained to the best purpose in promoting and maintaining the interests of the respective undertakings with which we are connected, and in doing so the benefit is reflected on all around us. Smeaton, the greatest and most amiable of the old engineers, has beautifully said that "the abilities of the individual were a debt due to the common stock of public happiness or accommodation," a maxim worthy of acceptance by all of us. We cannot live to ourselves; our influence extends beyond the sphere of our

actions, and becomes impressed upon society itself, and they who contribute most to its accommodation and happiness are its greatest benefactors.

Perhaps the remarks I have thus had the honour of bringing before you might justly be considered incomplete, were I not briefly to notice the greatly improved facilities for the study of applied science which are being disseminated over all the great centres of population in this country; and, to the honour of the intelligent and industrious citizens of Leeds, the "Yorkshire Exhibition of Industry and Art," now being held in this town, is calculated not only to widen, but to deepen, the channels of technical knowledge, which can alone support and maintain the high position gained by this country in arts and manufactures in the race of European nations.

This subject is calculated to lead me into a wide field of interesting discussion, but I feel that I have already occupied too much of your time; and I have only further to thank you for your courtesy and kindness, and for the patience and attention with which you have been pleased to listen to me.

Appointment of Scrutineers.

Mr. Walter W. Hutchinson and Mr. Craumer, of Malton, were appointed scrutineers of the ballot papers for the election of committee and officers of the association for the ensuing year.

An adjournment then took place for luncheon.

Papers Read.

At the afternoon sitting the reading of papers was commenced. We name them in the order in which they were read, reserving their publication, and the report of the discussions thereon, as usual, for succeeding numbers.

The first paper read was by

Mr. G. Livesey, of London, on "Hills's Liquor Process for Purifying Gas."

Mr. G. Anderson, of London, read a paper on "Building and Heating Retorts," and

Mr. John Tindall, of Walsall, read a paper on "Retort Settings, with special regard to the Construction of Furnaces and Economization of Fuel."

The discussions on these two papers were taken together.

Mr. S. H. Warren, of Crewe, read a paper on "Mechanical Stoking."

The discussion upon this paper was deferred until the next sitting.

In the evening a lecture was delivered by Mr. A. Vernon Harcourt, M.A., F.R.S., Lee's Reader of Chemistry at Christ Church, Oxford, and one of the Metropolitan Gas Referees, on "Experimental Inquiries concerning the Purification and Illuminating Power of Coal Gas."

At the close of the lecture, which will be duly reported, a cordial vote of thanks was given to Mr. Harcourt.

Wednesday, June 9.

The President took the chair this morning at eleven o'clock.

Additional Members.

The Secretary read the names of the following candidates for admission as members of the association:—

ORDINARY MEMBERS.

Hunt, H.	Brinscourt and Chalford.
Legg, H.	Ossett.
Martin, Jno.	Wadebridge.

EXTRA-ORDINARY MEMBERS.

Mackay, A.	Edinburgh.
Newton, Robert	Oldham.
Stewart, D. V.	Manchester.

It was unanimously resolved that the gentlemen whose names have now been read be elected members of the association.

Premiums for Papers.

The President: Gentlemen, I have now a very pleasing duty to perform in announcing at this stage of our proceedings the premiums that have been awarded for the papers read at the last meeting. After due consideration, the adjudicators have reported to the committee that in their judgment the best paper was that of Mr. Douglas, of Portsea, on "Gasholder Tanks in Concrete," and they have therefore awarded to him the president's medal. (Cheers.) The next paper in point of merit they consider was that by Mr. George Anderson, on "Purification," and they have unanimously agreed to award him the premium of £10. (Cheers.) The next paper in order they consider was that by Mr. Warner, of South Shields, on "Meters," and I am sure that every one present will agree with them that it is well worthy of the third premium of £7. (Cheers.)

Papers and Discussions.

The discussion of Mr. Warren's paper was then taken.

Mr. R. P. Spice, of London, having been unable to prepare a paper on "Water Gas: its Manufacture and Value," as promised, made an extempore statement on the subject, giving the results of his experience. He also exhibited a model of his settings of vertical retorts for the production of hydrogen and carbonic oxide gas. A number of questions were proposed and answered in reference to the process.

Mr. Douglas, of Portsea, read a paper on "Systematic Testing of Consumers Meters." Before doing so, he said: Allow me just one word in recognition of the compliment paid to me by the award of the president's medal, which was announced at the commencement of this sitting. I am bound to acknowledge this the more because the interest which my paper excited was not due so much to the paper itself, as to the novelty and merit of the subject which it brought before the association. I may say that I was indebted to my friend, Mr. Livesey, for the suggestion, which I looked upon at the time as a very small matter. Seeing, however, to what importance it has grown, I cannot but be reminded of the ancient saying, "Behold, how great a matter a little fire kindleth." I shall ask permission of the committee to be allowed to print in the appendix to the "Transactions," a statement of the results of the tank I constructed, and some further information with regard to the use of concrete.

The morning setting then closed.

At the afternoon meeting the discussion on Mr. Douglas's paper was first taken, after which,

Mr. W. Cleland, of Liverpool, read a paper on "Economy of Force in Gas-Works, in Reference to Condensing, Exhausting, and Scrubbing."

Mr. Key, of Accrington, had a paper on "Station Governors for Gas-works," but for want of time it could not be read. Mr. Key, at the request of the president, gave a verbal description of his proposed arrangement, which he illustrated with some well-prepared and striking diagrams. The paper (with others which were "taken as read") will appear in the "Transactions."

Adoption of a New Rule.

The President said there were several members upon the roll of the association whose names had been retained for a number of years, without any subscriptions having been paid by them, although they regularly received the "Transactions" and papers of the association. It was felt desirable that some new rule should be adopted, under which such persons would become disqualified from continuing to be members.

The Secretary read the following new rule on the subject, recommended for adoption by the committee:—

"The committee shall bring before the members, at their annual general meeting, the names of such persons as may have allowed their subscriptions to fall into arrear for two consecutive years, exclusive of the current year, whereupon the defaulters shall be struck off the list, and cease to have any advantage, right, or privilege in the association, unless sufficient cause is shown to the contrary. In the event, however, of any such member paying up all the arrears, he shall be entitled to readmission without re-election."

The adoption of the rule having been moved and seconded,

Mr. Storer, of Stafford, asked whether, if a member were struck off for non-payment of his subscription, and afterwards desired again to join the association, he would be required to pay the arrears up to the time of his readmission, or only up to the time at which he ceased in the first instance to be a member.

The Secretary said he would have to pay up all the subscriptions in arrear at the time he ceased to be a member, and those which came due up to the time at which he sought readmission.

The motion was put, and carried unanimously.

Time and Place of Next Meeting.

It was resolved, without any discussion, that the next annual general meeting of members shall be held in London, beginning on the second Tuesday in June, 1876.

Mr. Newall said he thought the present would be a good opportunity for passing a resolution to the effect that the future meetings of the association should extend over three days, in addition to the day devoted to the excursion. It seemed that every year several papers had to be left unread for want of time. He proposed a motion to that effect.

Mr. Broadhead seconded the motion, and said he thought it was only courteous to those gentlemen who took the trouble to prepare papers that a full opportunity should be given for the reading and discussing of their productions. It was a pity that so many of these papers every year were, under existing arrangements, necessarily "taken as read." It was very nice to see these papers afterwards in print, accompanied with drawings, but it would be far more satisfactory and instructive to hear them read and discussed.

Mr. Douglas admitted that it might be very desirable to have three days sittings; but it would be better not to make a rule absolutely extending the meetings in that way, unless there was a prospect of business to fill up the time. He suggested that it should be left to the committee to decide, from year to year, according to the number of papers sent in.

Mr. Newall at once fell in with the suggestion, and said he should be willing to leave it to the committee to determine whether there was business enough to occupy three days profitably.

Election of Committee and Officers.

The Secretary read the report of the scrutineers as to the result of their examination of the ballot papers, from which it appeared that the following gentlemen had been elected for the ensuing year:—

President.—Mr. Robert Morton.

Vice-Presidents.—Mr. R. P. Spice, Mr. John Douglas, and Mr. W. Foulis.

Treasurer.—Mr. Henry Newall.

Secretary.—Mr. W. H. Bennett.

Committee.—(New members to replace those going off by rotation) Mr. H. Woodall, Mr. S. Hunter, Mr. J. West.

Finance Committee.—Mr. G. T. Livesey, Mr. Jabez Church, and Mr. G. W. Stevenson.

Auditors.—Mr. S. P. Leather and Mr. A. Hersee.

The President: I presume, gentlemen, you are all aware of the loss we have sustained in the lamented death of our friend, Mr. Jabez Church, which took place after the time of issuing the ballot papers for the election of officers. Mr. Church having been re-elected by the votes to-day, it will now be necessary for the general committee to appoint some gentleman to fill the office which he held as a member of the Finance Committee. The general committee, therefore, recommend to the association the name of Mr. Corbett Woodall, and I shall take the sense of the meeting upon that recommendation.

Mr. R. K. Jones: I beg to move that Mr. Magnus Ohren be appointed in the place of Mr. Church.

This motion having been seconded,

Mr. Simpson asked whether it would much interfere with the transaction of business if no fresh appointment were made, and the Finance Committee consisted of only two members.

The President said he thought it better to comply with the rule, which said the Finance Committee should consist of three members.

Mr. J. Douglas said the position in which they were placed that day, by the regretted death of Mr. Church, was an awkward one, because Mr. Magnus Ohren, in the kindest way, no doubt, had since sent out a circular, asking members to vote for him. Now, however desirable Mr. Ohren might be as a member of the Finance Committee, it was contrary to rule that he should have put himself forward in that way. Supposing, instead of Mr. Church having died, it had been Mr. Morton, it would have been very unfortunate that any one should put himself forward for the president's chair, outside the rules of the association, and without having been nominated in the usual manner. He suggested that it would be a tribute to Mr. Church that his name should stand on the committee, he having been elected a member, until the next year.

Mr. R. K. Jones thought it would be quite impossible for the president to declare a deceased member to be elected on the Finance Committee.

Mr. Key thought the proper course would be to pass a resolution putting on record the respect entertained by the members of the association for the late Mr. Church, and then to adopt the recommendation of the committee, and elect Mr. Woodall in his place.

The President said if he had any discretion in the matter he should certainly rule in favour of Mr. Douglas's proposition.

Mr. J. Douglas: I move that the scrutineers report be accepted.

Mr. Simpson: I second it.

Mr. Broadhead: We voted in ignorance of the death of Mr. Church—now we know it. I think it would be well that the secretary send a letter of condolence from the association to Mr. Church's family, and that we should proceed to elect another member. I support the view of the committee, and shall vote that Mr. Woodall be that member.

Mr. Wood asked whether the general committee had not the power to elect a member to fill up a vacancy caused by death in this way. If so, it should be left in their hands under present circumstances.

The Secretary said the general committee had no power to appoint; they could only nominate some one for election by the members.

The motion made by Mr. Douglas was then put to the meeting, and carried.

Death of Mr. Jabez Church.

Mr. Spice: Mr. President and gentlemen, it is my painful duty to refer to the great loss we have sustained by the death of our old and valued friend, Mr. Church. No one feels that loss more than myself. Few men worked with him more than I, and perhaps no man worked more against him; but I am bound to acknowledge that, whether we worked together or on opposite sides, I always found Mr. Church, as I am sure we all found him, a most genial, warm-hearted, earnest, and upright man—a man equal to all the duties to which he was called, and one who on all occasions was ready to do a kindly act and render a good service, whether to individuals or associated bodies of men. (Hear, hear.) He was an honour to his profession, and his death is a great loss to every one of us. It has been suggested that a vote of condolence with his bereaved family should be passed at this meeting, and I am asked to propose such a resolution for your acceptance. You will, I am sure, be ready in that way to give expression to the respect in which our departed friend was held by the association, and of your personal sympathy with his afflicted relatives. I ask you to pass the vote upstanding.

The whole of the members rose to their feet, and the vote was passed in pro-

found silence. The secretary was then directed to communicate the vote to Mr. Church's family.

VOTE OF THANKS TO THE AUTHORS OF PAPERS.

Mr. HARTLEY: It affords me pleasure to propose a vote of thanks to the gentlemen who have prepared and read papers on this occasion. I am sure we all feel satisfied that the interest of the members has been as well sustained on this as at our former annual gatherings, and shall heartily join in thanking those gentlemen who have so largely contributed to that end.

Mr. BRUCE PEEBLES: I most cordially second the motion, and in doing so would call the attention of members, who on future occasions may prepare papers for our instruction, to the admirable specimens of wall drawings exhibited by Mr. Key, in illustration of his communication. I consider them to be well worthy of imitation.

The motion was put, and carried unanimously.

The PRESIDENT remarked that all the papers read were of a high order, and fully sustained the credit of the association in former years.

VOTE OF THANKS TO THE COMMITTEE.

Mr. G. PARKINSON: I have much pleasure in proposing that the thanks of the meeting be offered to the committee for the able manner in which they have conducted the business of the association in the past year. I need say nothing in support of this resolution; I am sure you are all satisfied with what the committee have done, and will accord them a hearty acknowledgment of their services.

Mr. SIMPSON seconded the motion, which was put, and carried unanimously.

VOTE OF THANKS TO THE TREASURER.

Mr. MAGNUS OHREN: I have to move that the cordial thanks of the association be presented to Mr. Newall for his kindness in filling the office of treasurer during the past year.

The motion was duly seconded, and carried unanimously.

Mr. NEWALL, in acknowledging the compliment, said: I thank you for this vote, although I am a treasurer without anything to do. Some two or three years ago, I did act as treasurer, but it was then decided that there should be a Finance Committee, since which time I have been out of work. But I quite agree with you that the funds should be kept in London, so as to be readily applicable whenever required. I have the honour to be one of your trustees, and as such I am responsible for the invested money; but as far as regards the treasurership, I want to be relieved from an office which has now no duties.

Mr. SPICE: I find that Mr. Newall holds all our securities, and as he says he has nothing to do, perhaps he will kindly consent to do it for twelve months longer.

Mr. NEWALL: I quite consent, on the understanding that you know I have nothing to do with the funds.

Mr. SIMPSON suggested that the treasurer should be one of the Finance Committee.

VOTE OF THANKS TO THE SCRUTINEERS.

Mr. BROADHEAD moved a vote of thanks to the scrutineers, and said he should like to suggest to the committee to take into consideration, before next year, how the duties of the scrutineers could be performed without depriving those gentlemen of the opportunity of being present at the meetings and hearing the papers read and discussed.

Mr. CRAVEN seconded the motion, which was put, and carried unanimously.

VOTE OF THANKS TO THE PRESIDENT.

Mr. J. DOUGLAS: I have now a resolution to propose which I submit to the meeting with a great deal of pleasure. We have had now, as an association, a considerable period of existence—somewhere, I believe, about 12 years—and during the whole of that time it has been our good fortune to have a succession of able men to fill the presidential chair and regulate the proceedings at our annual gatherings. But I will venture to say that during the whole course of the history of the association we have never had a president who has filled that chair with more urbanity, ability, and gentleness than Mr. Paterson has displayed on the present occasion. (Cheers.) It is a serious thing for a man of his retiring disposition to undertake the performance of such duties, but having consented to fill the post of president, I am sure he has discharged all its functions in a manner which commands our admiration, and deserves our thanks. (Cheers.) The able paper which he read to us yesterday traversed the whole science of gas manufacture, and not only so, but it went a little farther, and extended itself somewhat into the sphere of political economy. I have no doubt that those who heard, and those who will hereafter read it, will be much benefited thereby. We have had a most successful meeting, and must all feel that it is to our president, in conjuction with our worthy secretary, that such arrangements were made as to cause everything to go off so satisfactorily. I ask you, therefore, to accord a vote of thanks to our president for the great services he has rendered the association, and for his able conduct in the chair.

Mr. NEWALL seconded the motion, which was carried amidst loud cheers, the whole of the members standing.

The PRESIDENT: Gentlemen, I feel overcome with your kindness to me, and can hardly find words to express my sense of obligation for the way in which you have responded to the vote proposed by Mr. Douglas. If there is anything indeed that could contribute to enhance the enjoyment I have experienced on this occasion, in holding a position the highest that any gas engineer can hold, and the highest it is in the power of this association to confer, it is supplied in the vote you have just presented to me. I flatter myself that the interests of this association have not suffered in my hands, and I cordially thank you for having given expression to your approval of any services I have rendered.

VOTE OF THANKS TO THE SECRETARY.

The PRESIDENT: Before I sit down, I have a further pleasing duty to perform. I dare say you are all aware of the valuable services rendered to the association by our worthy secretary, Mr. Bennett. His duties are of a very arduous kind, and they are most faithfully, honestly, and earnestly discharged. (Hear, hear.) Much, indeed, of the prosperity of this association may be traced to the energy, ability, and zeal of Mr. Bennett. The committee are fully aware of his labours in its behalf, and, in order to testify the very high respect which they entertain of the importance of his services, they have been pleased to award him an addition of £40 a year to his salary. I am quite sure that you will agree with me that he most thoroughly deserves it. I propose that we now give him a vote of thanks, with the expression of our hope that he may long be spared to occupy the position he now holds. (Cheers.)

Mr. HARTLEY seconded the motion, which was put, and carried unanimously.

Mr. BENNETT said: Mr. President and gentlemen, I hardly know how to acknowledge the compliment just paid to me in language such as I could wish. Our president has made some very kind remarks upon the manner in which my duties have been performed, and I can only say I thank him exceedingly for those observations. I also sincerely thank the members present for the way in which the vote has been received. You will pardon me if I am brief in responding, because my duties call me elsewhere for the purpose of making arrangements for your comfort in the next hour's time.

The business sittings were then brought to a close.

In the evening the members and friends dined together, and on the following day there was an excursion, according to arrangement, the account of which must be deferred until our next number.

MANCHESTER DISTRICT ASSOCIATION OF GAS ENGINEERS.—The regular meeting of the members of this association took place at Rochdale, on Saturday, the 29th ults., under the presidency of Mr. Samuel Hunter, engineer of the Rochdale Gas-Works. The members met at Manchester, and were conveyed to Rochdale by special omnibus, where they arrived about three o'clock. The company at once proceeded to the gas-works, which, on the invitation of their president, they inspected minutely, taking the various processes of the manufacture *seriatim*. The party, numbering about 50 gentlemen from every gas-works in this part of the kingdom—from Grantham on the one side to Stafford on the other—were shown through the works by Mr. Hunter, examining carefully the retort-house, condensers, scrubbers, purifying-houses, gasholders, meter-houses, engine and exhauster houses, fitting shops, laboratory testing-room, and stables, and the gentlemen present expressed their unqualified satisfaction and admiration at the state of the works. There seemed, indeed, a general opinion that the Rochdale works are unequalled, or at least unsurpassed by any other in this part of the country. After going through the works, the mayor, who was present, invited the strangers to visit the town-hall, and in the mayor's parlour a slight refection of wine and biscuits was provided by his worship. After being shown through the town-hall, the company sat down to a sumptuous knife and fork tea, provided by Mr. Hunter, the president, and served up by Messrs. Smethurst and Butterworth in excellent style. After tea, and the usual loyal toasts having been given, the president explained the objects of the association, which comprised generally the spread of information relating to the making and distribution of gas, and that the association was confined strictly to gentlemen having the sole charge of gas undertakings. The health of the mayor, the chairman of the Gas Committee, together with that of Mr. Hunter, was proposed by Mr. Jacques, gas engineer, Stockport, who took the opportunity of remarking that he had had considerable experience in the construction and management of gas-works, that he had seen all the London gas-works, and a good many provincial ones, but he had never seen one to equal the Rochdale Gas-Works. He approved of every detail, and in future alterations on his works should take them as his model. He congratulated Mr. Hunter on their successful completion, and referred to the extraordinary labour and anxiety which must have been spent in the devising and carrying out of so comprehensive a scheme. He pointed out that it was far more difficult to alter the old works, at the time that the process of gas-making was going on, than to build new works. Mr. Harrison Veevers, engineer of the Bolton Gas-Works, seconded the motion, and in the course of a complimentary speech entirely endorsed what had been said by Mr. Jacques. The mayor, the chairman, and Mr. Hunter suitably acknowledged the toast. Mr. Hutchinson, manager and engineer of the Barnsley Gas-Works; Mr. Storer, of Stafford; Mr. Wood, of Bury, and other gentlemen, gave short addresses, eulogizing the Rochdale Gas-Works and the president (Mr. Hunter), and about eight o'clock the company separated.—*Rochdale Observer.*

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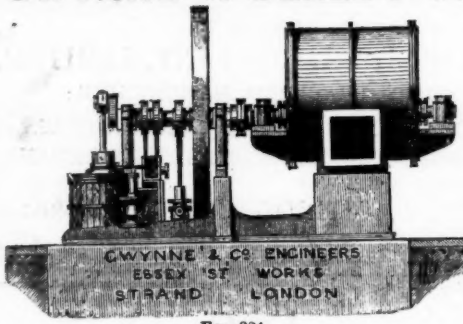

FIG. 224.

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(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

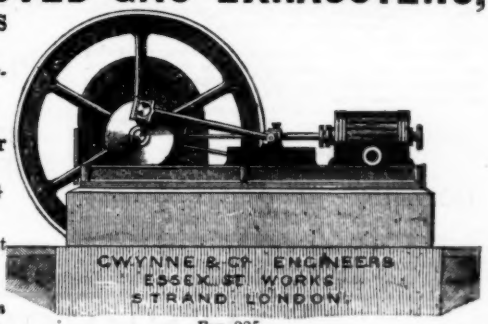


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

WANTED, a Meter Prover for a manufactory in Lancashire. To an experienced man high wages will be given.
Address No. 167, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Foreman Stoker. He must be steady and attentive, and have had practical experience in a Gas-Work.
Apply, by letter, stating age, where last employed, and what wages would be required, addressed to JOSEPH WOOD, Gas-Works, Bury, LANCASHIRE.

TO SULPHATE MAKERS.

WANTED, a Working Foreman, capable of taking charge of a small Sulphate Works and Tar Distillery. Good wages, with house and garden, to a competent man.
Apply, with terms and references, to No. 168, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHESTERFIELD WATER-WORKS AND GASLIGHT COMPANY.

WANTED, a Gas-Fitter, accustomed to iron and compo fitting, and willing to make himself generally useful.
Applications, stating age and wages required, to be addressed to the undersigned, and none but experienced and sober workmen need apply.
CHARLES E. JONES, Manager.

METER INSPECTOR.

WANTED immediately, by a Gas Company in South Wales, a steady, respectable young Man as METER INSPECTOR, and to make himself generally useful. Must thoroughly understand meters and consumers fittings. Salary £75 per annum.
Apply, with copies of testimonials, stating all particulars, to No. 165, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a re-engagement as MANAGER, where the make is from 6 to 12 millions. The Advertiser has had 20 years practical experience in the erection, management, and distribution of gas. Five years foreman in erecting works (home and foreign). Eight years in last and present situation. Good references and testimonials. Aged 39.
Address No. 156, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an appointment as Manager or Secretary of a Gas Company, or would treat for the lease of any works where the gas-rental does not exceed £2000 per annum. The advertiser has had 21 years experience in his profession. He is competent to advise upon, and to prepare plans, specifications, and estimates for new works or extensions. Can give first-class testimonials and security if required, and would be willing to have his salary influenced by the results of his management.
Address No. 164, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED immediately, a Gas-Fitter, &c. Must be thoroughly competent to read meter-registers correctly, and have had some experience in this work, also to undertake service-laying, putting up fittings, attending to complaints, and the general duties required by a company with about 1000 consumers.
Apply (at first by letter, in own handwriting) to the SECRETARY, Gas Office, SHEERNESS-ON-SEA, and state age, if married or single, wages required, last employment, with copies of testimonials, the originals of which can be afterwards produced. A steady, industrious, and civil man may secure a permanent engagement.

THE Advertiser, aged 28, having over eleven years experience in gas manipulation, desires a re-engagement, either as MANAGER or Assistant Manager in large works. Has lately returned from abroad, and has no objection to proceed abroad again. Good testimonials.
Address No. 159, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED.

THE Directors of the Hexham Gaslight Company will require in August next the services of a competent MANAGER for their works. He must have a thorough knowledge of the manufacture and distribution of gas, setting retorts, main and service laying, as well as the regular routine of a Gas-Work.
A certain amount of book-keeping will be required of him, the taking of meters and collecting of accounts. The whole of his services to be devoted to the Company. Security will be required.
Applications, with testimonials and references, stating age, salary, and present engagement, to Dr. Stainthorpe, Chairman of the Hexham Gaslight Company, Hexham, on or before Wednesday, the 23rd day of June, 1875.
By order of the Directors,
T. C. WILTHEW, Secretary.

NEW EDITION, NOW READY,
ADVANTAGES OF GAS FOR
COOKING AND HEATING.
By MAGNUS OHREN, A.I.C.E., F.C.S.
For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works, Lower Sydenham, London, S.E.

Now ready, Second Edition, price 7s., by post 7s. 3d., the
GAS MANAGER'S HANDBOOK.
By THOMAS NEWBIGGING, A.I.C.E.

Orders to be sent to the Publisher,
WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

THE BRITISH ASSOCIATION OF GAS MANAGERS AND THEIR FRIENDS.

A First-Class PHOTOGRAPHIC GROUP of the above, 12 in. by 10 in.,
TAKEN ON THE OCCASION OF THEIR
ANNUAL PIC-NIC AT STUDLEY ROYAL, RIPON, YORKSHIRE,
JUNE 10, 1875.

COPIES OF THE ABOVE SENT ON ROLLER, POST FREE, TO ANY ADDRESS, PRICE 3s. 6d. EACH.

WM. CHILD, PHOTOGRAPHER, WELLINGTON STREET, LEEDS.

MESSRS. JOHN BETHELL & CO.,
(ESTABLISHED 1836,)
CONTRACTORS for GAS TAR,
MAKERS OF ANTHRACENE, CREOSOTE, &c.,
CLAYTON CHEMICAL WORKS, MANCHESTER;
SWAN VILLAGE, WEST BROMWICH.
Head Offices: 38, KING WILLIAM STREET, LONDON BRIDGE.

JAMES MILNE & SON,
GAS ENGINEERS,
Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
EDINBURGH, AND
2, KING EDWARD STREET,
NEWGATE STREET, LONDON.
Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

LIME SUPERSEDED
IN THE
PURIFICATION OF ILLUMINATING GAS
BY
SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

TESTIMONIALS SENT ON APPLICATION TO
SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,
VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER;
SOLE MANUFACTURERS OF SPENCE'S PATENT DRY COPPERAS, SPENCE'S PATENT GAS DEODORIZER, AND MUDIE'S DISINFECTANT;
MANUFACTURERS OF
SULPHATE OF AMMONIA, VITRIOL, COPPERAS, &c.;
PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

D. BRUCE PEEBLES & CO.,
ENGINEERS,
FOUNTAINBRIDGE WORKS, EDINBURGH,
MANUFACTURERS OF WET AND DRY GAS-METERS;
Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,
ABOVE 30,000 OF WHICH ARE NOW IN USE.
"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*
D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

WANTED, to lease Gas-Works, or to MANAGE Works making not less than 12 millions annually. Sea coast preferred.
Address, stating terms, to No. 162, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A 4-horse Engine and Exhauster, to pass 10,000 cubic feet per hour. Self-acting bye-pass and two gas-valves, 8-in. connexions and exhauster governor.
For further particulars, or to view the same now working, apply at the GAS-WORKS, WALTON-ON-THAMES.

TO GAS MANAGERS.

FOR SALE—Ten 15-in. round Retort MOUTHPIECES, with wrought-iron lids and screws complete, in good condition.
Apply to Mr. THOMAS WILKINSON, Manager, Gas-Works, Newmarket, SUFFOLK.

GAS APPARATUS FOR SALE.

THE Atherton Local Board have on Sale Four Dry-Lime PURIFIERS, 5 feet square, with cast-iron covers and lifting apparatus complete; centre-valve, with 8-in. inlet and outlet pipes.
Also, EXHAUSTER and ENGINE combined, by Musgrave and Sons, with 8-in. inlet and outlet pipes, two 8-in. changing valves, and bye-pass.
Further particulars on application to
D. SCHOFIELD, Clerk.

GAS-METERS REQUIRED.

THE Fareham Local Board of Health invite TENDERS, stating lowest price each, for the most efficient GAS-METERS for their public lamps, delivered at Fareham Station.
Sealed tenders, endorsed "Tender for Meters," to be sent to H. Clark, Esq., Chairman, Local Board of Health, Fareham, on or before the 24th of June inst.
By order of the Board,
ALFRED DRIVER, Clerk.
Dated June 5, 1875.

TO TAR DISTILLERS, &c.

THE Directors of the Wrexham Gaslight Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their works, for One, Two, or Three years, as may be agreed upon.
Particulars may be obtained upon application to the undersigned, to whom tenders must be sent on or before the 1st of July next.
THOS. WALKER, Secretary and Manager.
Wrexham, June 8, 1875.

FOR SALE.

THE Stoke Gas Company have for Sale a Telescope GASHOLDER of the following dimensions—viz., bottom lift, 42 ft. by 16 ft.; top lift, 40 ft. by 16 ft., with chains and balance-weights. It can be seen at the above company's works.
The holder to be taken down and removed at the expense of the purchaser.
Any further information with respect to same may be obtained on application to Mr. John M'MILLAN, the Company's Secretary and Engineer.
Wharf Street, Stoke-on-Trent.

THE Scarborough Gas Company have FOR SALE, in consequence of removing to their New Works, a first-class Telescope GASHOLDER, 52 ft. in diameter and 44 ft. deep. It was made and erected by C. and W. Walker, of Donnington, in 1868, and is in excellent condition. It is of remarkably good workmanship, being perfectly circular and true, and free from all irregularities. The columns and girders are of handsome design and highest class of work.
Gas Companies wanting a good Gasholder this year will find this an advantageous opportunity.
For further particulars apply to
JAMES MOON, Gas Engineer, Scarborough.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Bedford Gaslight Company are prepared to receive TENDERS for their surplus TAR, also for their AMMONIACAL LIQUOR, at the Bedford Gas-Works, Bedford.
The Contract to commence the 1st of July, 1875, and to be for two years.
The tenders to be sent in on or before the 22nd day of June, 1875, and at a price per ton, or per cask of 36 gallons.
The Works are connected by a siding to the Midland and London and North-Western Railways.
Any further particulars may be obtained on application to W. H. SMITH, Engineer, at the Works.
The Directors do not bind themselves to accept the highest or any tender.

TO TAR DISTILLERS, &c.

THE Directors of the Kingston-upon-Thames Gas Company, are prepared to receive TENDERS for the surplus TAR produced at their works, at Kingston, from July 1, 1875, to June 30, 1876. Quantity about 90,000 gallons. Tenders to be at per gallon, f.o.b. the Contractor's barge.
Further particulars may be obtained from Mr. Packham, Manager, at the works, where a copy of contract may be seen.
Tenders to be sent to Mr. W. A. Fricker, Secretary, Gas Offices, Church Street, Kingston, on or before the 22nd of June inst., endorsed "Tender for Tar."
The Company do not pledge themselves to accept the highest or any tender. By order,
W. A. FRICKER, Secretary.
Gas Offices, Kingston, June 8, 1875.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
CHARLES HORSLEY, Agent.

WIDNES LOCAL BOARD.

WATER-WORKS.

THE Board invite Tenders for the sinking of two shallow WELLS, of 30 and 34 ft. deep respectively, upon land situated in Little Woolton.
Plan and specification may be seen at the Engineer's Office, Gas-Works, Widnes.
Tenders, endorsed "Tenders for Sinking Shallow Wells," and addressed to the Chairman of the Gas and Water Committee, to be delivered at the above Offices not later than 10 a.m. upon the 28th inst.
The Board do not bind themselves to accept the lowest or any tender.
HENRY ROBERTS.
Public Offices, Widnes, June 9, 1875.

GAS TAR AND AMMONIA WATER.

THE Leek Improvement Commissioners invite TENDERS for the GAS TAR and AMMONIA WATER produced at their works, for One, Two, or Three years, from the 1st of July next. Make of gas about 30 million cubic feet per annum.
Tenders to state price per ton of 2240 lbs. at the works, or delivered into boat at canal wharf. They must be received on or before Monday, the 21st inst., at Four o'clock p.m., addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Tar, &c."
The Commissioners do not bind themselves to accept the highest or any tender.
Further information may be obtained from the undersigned.
C. HENSHAW, Clerk.
Public Offices, Leek, June 10, 1875.

WINDSOR ROYAL GASLIGHT COMPANY.

THE Directors of this Company invite TENDERS for the supply of 3500 tons of GAS COALS (unscreened), to be delivered free at the Windsor Station of the Great Western Railway, such Coals to be either of the following descriptions—viz., New Pelton, Wearmouth Holmside, or Pelaw Main.
The Contractor to state for which Coals he tenders, as none others than those above specified will be received.
The Coals to be delivered as follows:—viz., July, 200 tons; August, 200 tons; September, 300 tons; October 500 tons; November, 500 tons; December, 600 tons; January, February, and March, 1876, 400 tons each.
The Company will undertake the unloading of the trucks.
The tender to be forwarded to me on or before the 5th day of July, 1875.
The Directors will not entertain any tender conditional on strikes, &c., or be bound to accept the lowest or any tender. GEO. CARTLAND, Secretary.
The Gas-Works, Windsor, June, 1875.

TENDERS FOR GAS COALS.

THE Directors of the Slough Gas and Coke Company are prepared to receive TENDERS for a supply of 1000 tons (21 cwt. to the ton) of either of the undermentioned GAS COALS, viz:
New Pelton,
Holmside,
Ravensworth Pelaw, or
Best Screened Silkstone Brights,
delivered at the Slough Railway Station, in quantities of 100 tons in July and August, and 200 tons in September, October, November, and December next. Of course, parties may tender for either one, two, or the whole of the descriptions named.
Tenders to be sent to the undersigned, endorsed "Tenders for Gas Coals," on or before the 1st day of July next.
ARTHUR THOMAS, Secretary.
Slough, Bucks, June 9, 1875.

TENDERS FOR GAS COAL.

THE Directors of the Tonbridge Gas Company are prepared to receive TENDERS for the supply of 1800 tons of best GAS COAL, to be delivered at their works in the following order:—

100 tons	first week in	July	next.
200	,, ,,	August	,,
250	,, ,,	September	,,
300	,, ,,	October	,,
250	,, ,,	November	,,
150	,, ,,	December	,,
100	,, ,,	January,	1876.
100	,, ,,	February	,,
100	,, ,,	March	,,
100	,, ,,	April	,,
100	,, ,,	May	,,

Tenders to be sent to the Secretary of the Company at Tonbridge, on or before the 21st of June inst., to state the name and description of the Coal, and to be endorsed "Tender for Gas Coal."
The Directors do not bind themselves to accept the lowest or any tender. By order,
JOSEPH SNELLING, Secretary.
June 12, 1875.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.
South Shields. W. J. WARNER.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.
J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

Mr. NORWOOD EARLE,
GAS SURVEYOR,
12, QUEEN VICTORIA STREET, E.C.,
Advises on all matters connected with the Distribution of Gas, Public Lighting, Gas Testing, &c.
Valuations made for Assessment and other Purposes.

D. A. GRAHAM,
CONSULTING GAS ENGINEER,
STALYBRIDGE, NEAR MANCHESTER,
Erects Horizontal Condensers, Retort Settings, Pumps, Self-Acting Exhauster Governors, Coal-Testing Apparatus, &c., &c.
Gas-Works surveyed, mapped, and reported on, and extensions or alterations designed and the particulars specified, and work estimated for and executed.

D. M. NELSON,
48, GORDON STREET (late 135, BUCHANAN ST.),
GLASGOW,
Supplies every requisite in connexion with the distribution of Gas and Water.
Estimates and prices on application.
WOOD GRIDS for Purifiers and Scrubbers, Cast-Iron PIPES and VALVES.
Street LAMP-PILLARS.
Patent Pipe SCREWING-MACHINES, &c.

Mr. ALFRED LASS,
60, CORNHILL, LONDON, E.C.,
Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

WM. RICHARDS,
INVENTOR OF THE DRY GAS-METER,
REVISER OF "HUGHES ON GAS-WORKS,"
CONSULTING GAS ENGINEER,
Advises on all matters of business connected with Gas Lighting. Furnishes Working Drawings of Retort-Settings, Specification of Works, complete or in detail.
11, ST. MICHAEL'S ROAD, STOCKWELL, LONDON, S.W.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, WESTMINSTER.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.
JACKSON, FOX, AND ELLER,
55, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, ½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.
Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

GARSIDE'S IMPROVED REGISTERED TUBE-VICE, holds all sizes of Wrought-Iron and Brass Tubes, from a 2-in. socket to the smallest brass tube made.

GARSIDE'S IMPROVED MAIN DRILLING CLIP, made in two sizes, to drill from 2-in. to 6-in. Mains, and from 6-in. to 12-in. Mains.
The above tools are made light and handy.
For drawings, &c., apply to the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

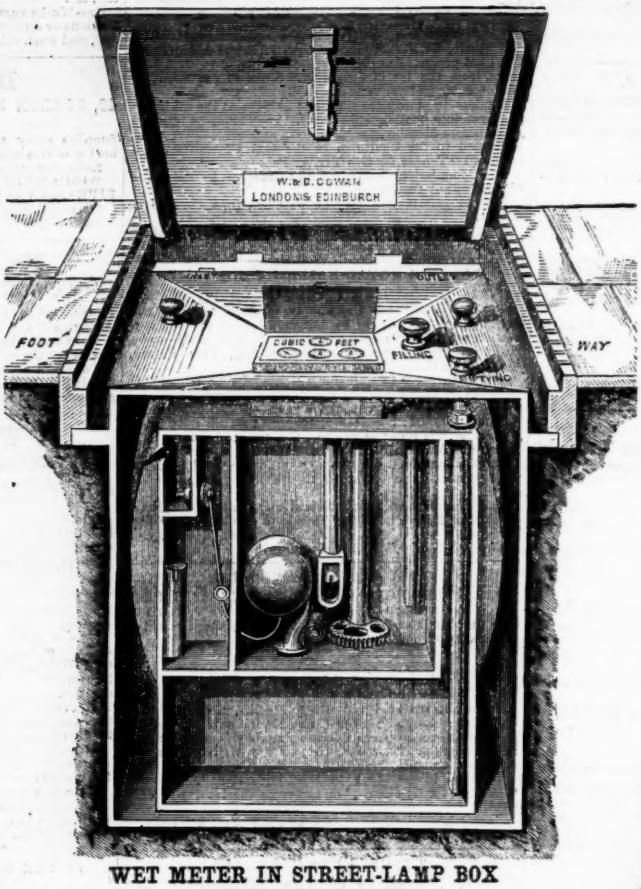
WOLSTON'S TORBAY IRON PAINTS.

THE Torbay and Dart Paint Company, Limited, 23, Great George Street, Westminster, S.W., having been informed that PAINTS not manufactured by them are being offered to Gas Companies and the public as "WOLSTON'S," hereby give notice that they will TAKE PROCEEDINGS against any persons infringing their rights as sole proprietors and manufacturers of Wolston's Torbay Iron Paints.
(See Advertisement on another page.)

AVERAGE METER SYSTEM

FOR

STREET-LAMPS.



WET METER IN STREET-LAMP BOX UNDER ROADWAY.

The above is offered as the best and simplest arrangement of Street-Lamp Wet Meter, and Box for placing under the roadway.

The index is read, the water supplied, and the overflow-box pumped, without disturbing any inside lid, but only the footway door.

When necessary to take out the Meter, remove the filling and emptying pluge, and the two thumb-screws which secure the inside lid, which can then be taken off, and the Meter disconnected at inlet and outlet unions.

To prevent water entering the box, the inside lid is made raised, and the edges returned over those of the box, and the thumb-screw and index openings are protected by "collars."

The footway frame can be supported either by brickwork or by "lugs" cast on the box.

The Meter shown is on Esson's Patent Fountain Principle, but it will be understood that the same box arrangement is equally applicable to non-fountain meters; and if these latter are furnished with WARNER AND COWAN'S PATENT SELF-REGULATING DRUMS, the long range of water-line renders a fountain superfluous, while the *registration will be practically unvarying.*

DRY METER
IN STREET-LAMP PILLAR

WET METER
IN STREET-LAMP PILLAR.

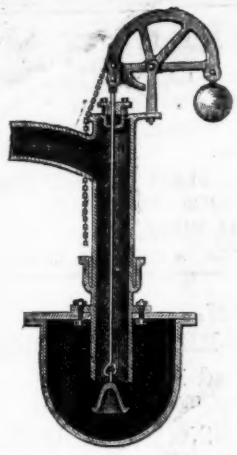
FOR PRICES, &c., APPLY TO THE MANUFACTURERS,

W. & B. COWAN,

ESTABLISHED 1827,

KING HENRY'S WALK,
BALL'S POND ROAD,
(NEAR DALSTON JUNCTION STATION.) **LONDON, N.**

BUCCLEUCH ST. WORKS,
EDINBURGH.



BOX'S

PATENT ANTI-DIP VALVE

Affords a clear gas way through the dip-pipe while the retort is in action, and produces a perfect seal at pleasure, or whenever the retort is open, offering great security against the drawing of air, and obviating the necessity for using any liquid in the now so-called hydraulic main. It is easy of application to existing apparatus, and is comparatively inexpensive. Is not likely to get out of order, as the tar, which will adhere to the botton of the dip-pipe and the flange of the cone, both of which are faced, will act as a lubricant, and prevent undue wear and tear. The whole, as will be seen on inspecting the accompanying illustration, is exceedingly simple, and every part accessible. To adapt it to the present dips, all that is necessary is to face the bottom edge of the dip-pipe, and suspend a cone by a rod, which passes through the bonnet, the raising and lowering of the cone being performed through the intervention of a weighted eccentric.

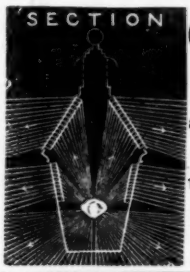
The Patentee is prepared to supply Patented Apparatus upon the most moderate terms, and will be happy to reply to any inquiries that may by adddressed as under—

W. BOX,

GAS-WORKS, CRAYFORD, KENT

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.



THE PATENT
CATOPTRIC LAMP
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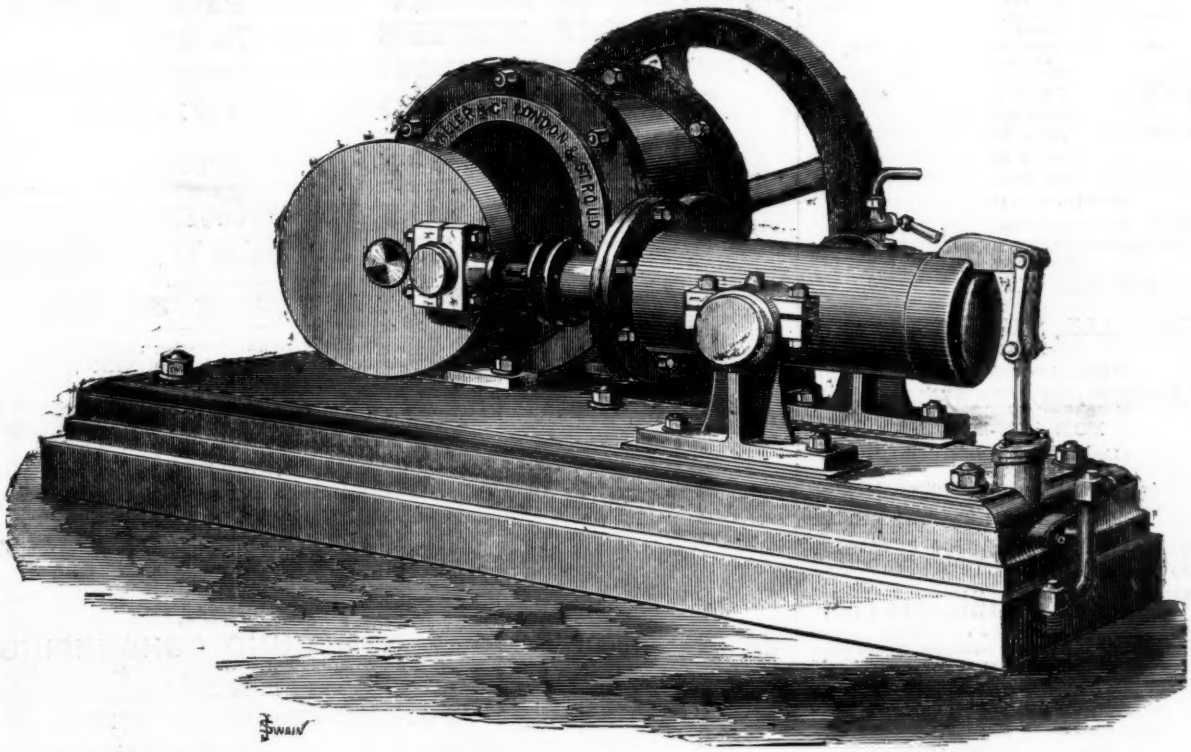
IMPROVED PATENT GAS-EXHAUSTERS

AND

COMBINED ENGINES,

ON ONE BASE-PLATE.



This arrangement has been designed by G. W. & Co. for small works, making from **300** to **1000** cubic feet per hour.
They occupy very small space, are simple in construction, of first-class manufacture, and not likely to get out of order.
The Exhausters are **extra large,** for driving at moderate speed.
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NOTE.—THE ABOVE ARE KEPT IN STOCK, AS WELL AS LARGER SIZES.

GEORGE WALLER & CO.,

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OXIDE OF IRON.—We are prepared to supply, on moderate terms,
HYDRATED PEROXIDE OF IRON (BOG OCHRE),
Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.
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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
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J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
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A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular .	14 in.,	15 in.,	16 in.,	18 in.
Ovals . .	17 in. × 14 in.,	17 in. × 15 in.,	20 in. × 15 in.,	21 in. × 15 in., &c.
D's. . .	14 in. × 14 in.,	15 in. × 12 in.,	15 in. × 13 in.,	17 in. × 14 in., 18 in. × 13 in.
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GAS STATION-METERS,
With all the joints planed.
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BEALE'S CONTINUOUSLY ACTING
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MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.
B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.
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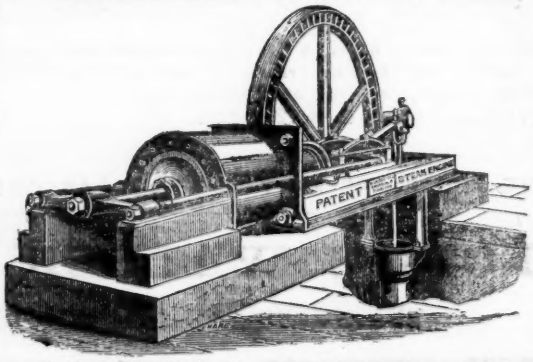
B. DONKIN & CO.,
PATENT HORIZONTAL COMPOUND CONDENSING
STEAM-ENGINES,
APPLICABLE FOR DRIVING GAS-EXHAUSTERS.



These Engines have been at work a sufficient number of years to prove their durability and efficiency.
One of them has been subjected to a scientific and exhaustive trial to test the consumption of fuel, with the result that an expenditure of less than 2 lbs. of coal per hour developed one indicated horse power.
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Small Cost—Compactness—Perfectly Self-Acting—Self-Regulating—Self-Cleansing—Smallest Boiler Pressure Sufficient—No Steam-Engine—No Gearing—No Attention—No Extra Room Required—No Tear and Wear—No Noise—No Oscillation in Vacuum, or Back Pressure.

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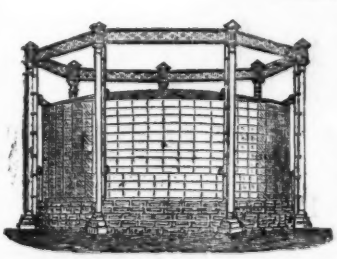

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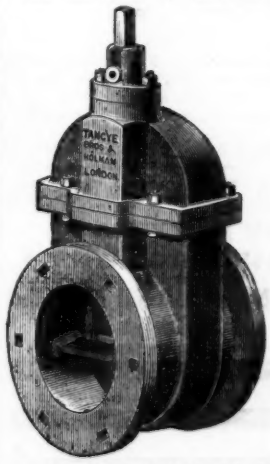

Inch.	s.	d.
2½	24	0
3	27	0
4	36	0
5	45	0
6	54	0
7	63	0
8	80	0
9	90	0
10	100	0
12	135	0
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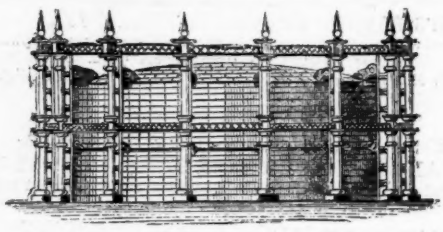

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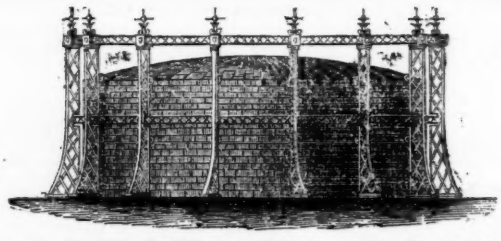

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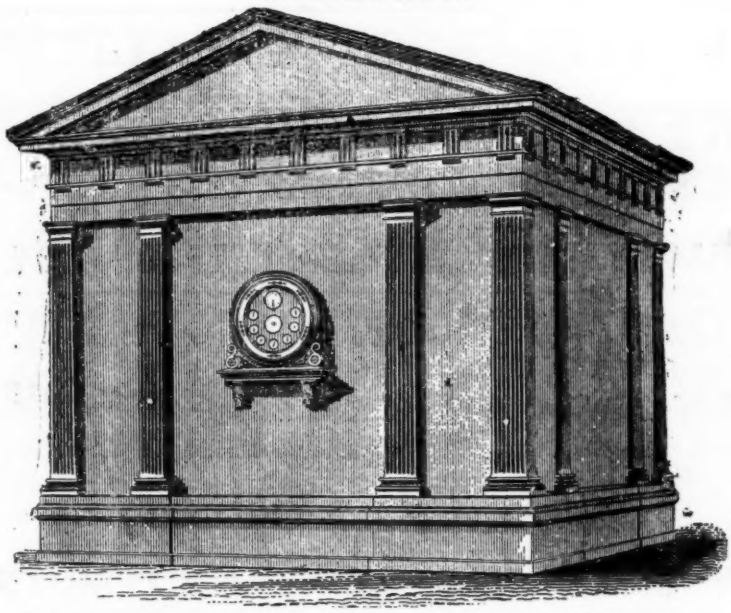

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FOUR-WAY VALVES, one of which is equal to three ordinary Valves.
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Which yields 10,575 cubic feet of 27·38 standard candle gas; and 1240 pounds of coke, containing 11·56 per cent. of ash; and

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Which yields 10,018 cubic feet of 21·97 standard candle gas, and 1260 pounds of very best splint coke. (This is also a first-class steam coal.)

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10,000 ..	20 candles. ..	12 cwt.

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This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
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CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

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LIMITED,

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Weight of coke in lbs. per ton of coal	**1,465**

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This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

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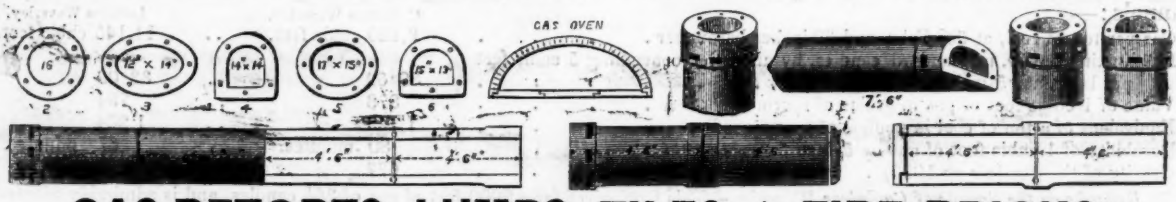

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THE

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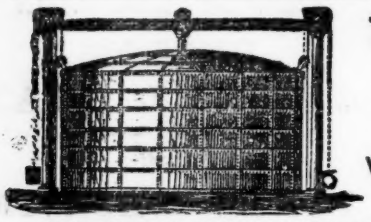

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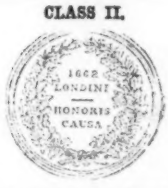

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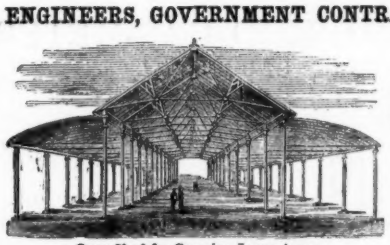

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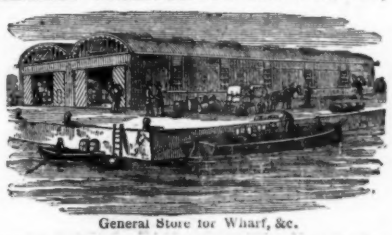

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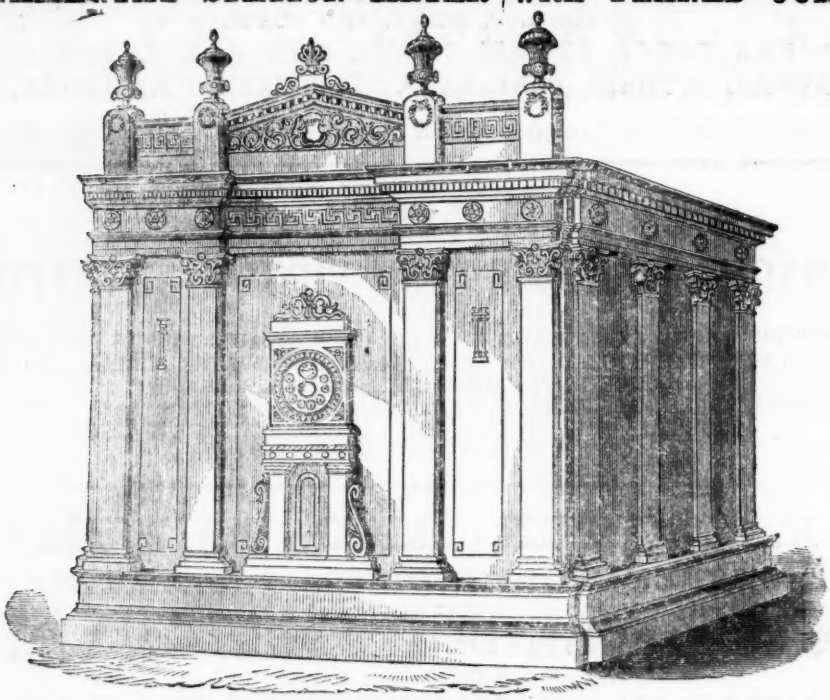
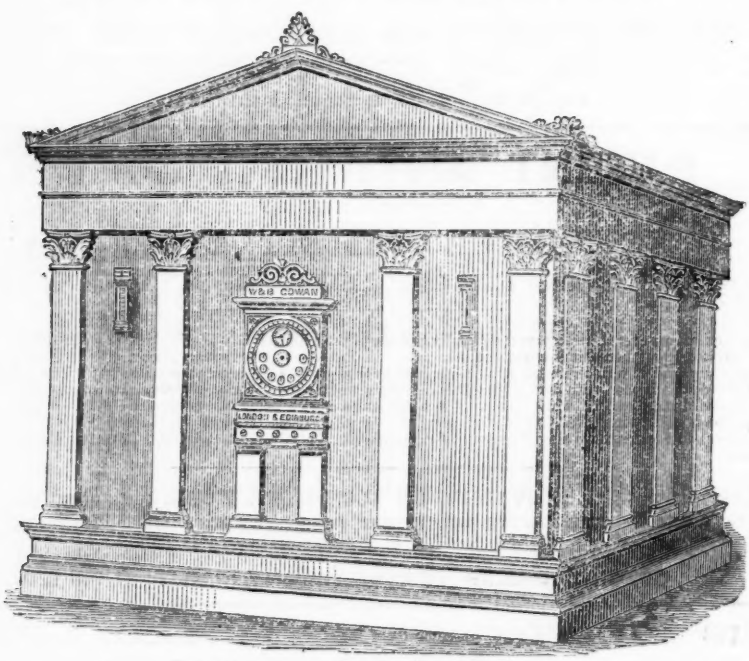


W. & B. COWAN'S PLAIN STATION-METER with PLANED JOINTS.



ORIGINAL LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S SELF-REGULATING (DRUM) GAS-METER.

GOVERNORS, PRESSURE REGISTERS, TEST GASHOLDERS, GAUGES, &c.

WET AND DRY METERS SPECIALLY MANUFACTURED FOR STREET-LAMPS.

PRICE LISTS ON APPLICATION.

W. & B. COWAN,

ESTABLISHED 1827,

KING HENRY'S WALK,
BALLS POND ROAD,
(NEAR DALSTON JUNCTION STATION,) LONDON, N.

BUCCLEUCH ST. WORKS,
EDINBURGH.

WILLEY AND FORD,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.

RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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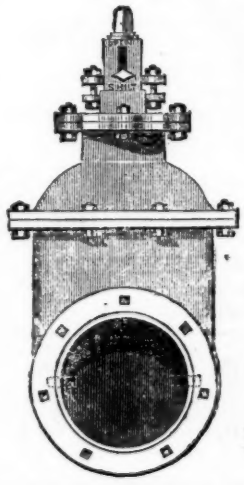
An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

☞ PLEASE NOTE THE ADDRESS–

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

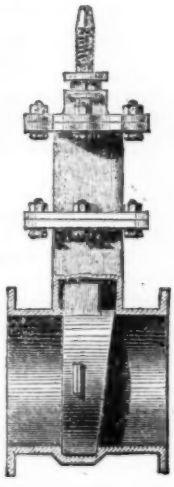
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



MIDLAND IRON-WORKS,
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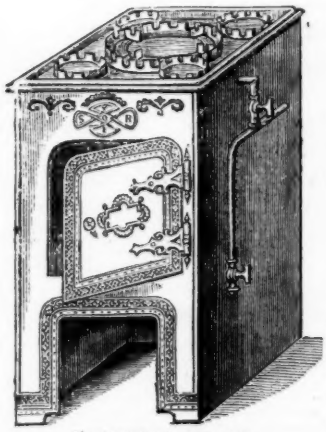


"SOYER"—No. 75.
15 in. wide, 27 in. high, with Dripping Pan, Gridiron, and Terra Cotta Radiator. Price £2 10s.

No. 77.
18 in. wide, 36 in. high.
Hot Plate, 24 in. by 21 in. Price £5.

SCOTT, BROWN, & CO.,

(LATE SCOTT AND BUTLER,)

CUMBERLAND WORKS, VITTORIA ST., BIRMINGHAM,

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS

FOR CULINARY AND DOMESTIC USE.

FOR EXCELLENCE OF DESIGN AND FINISH, COMBINED WITH GENERAL UTILITY AND EFFICIENCY, OUR GOODS ARE UNRIVALLED.

THE NEW REGISTERED "PARAGON" BOILING-STOVE

(From 2s. 3d. to 10s.)

IS THE MOST PERFECT ARTICLE OF THE KIND YET INTRODUCED.

PRICES AND TERMS ON APPLICATION.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

M. SELIG JUNIOR AND CO..

IMPORTERS OF

AMERICAN & OTHER FOREIGN TOOLS & MACHINERY,

WHOLESALE AND EXPORT MACHINERY MERCHANTS,

SOLE EUROPEAN AGENTS FOR THE

"TANITE" COMPANY'S SOLID EMERY WHEELS AND MACHINERY,

85, QUEEN VICTORIA STREET, LONDON, E.C.

THE "LIGHTNING" SCREW-PLATE.

It is warranted to do five times the work possible with any other screw-plate.

The threads cut with it are far more perfect than can be made with any other hand tool.

It finishes its work at one cut.

The dies are adjustable for wear.

Nuts and bolts threaded with it always correspond, without trying and matching.

THE CHASE'S PIPE-SCREWING AND CUTTING MACHINE.

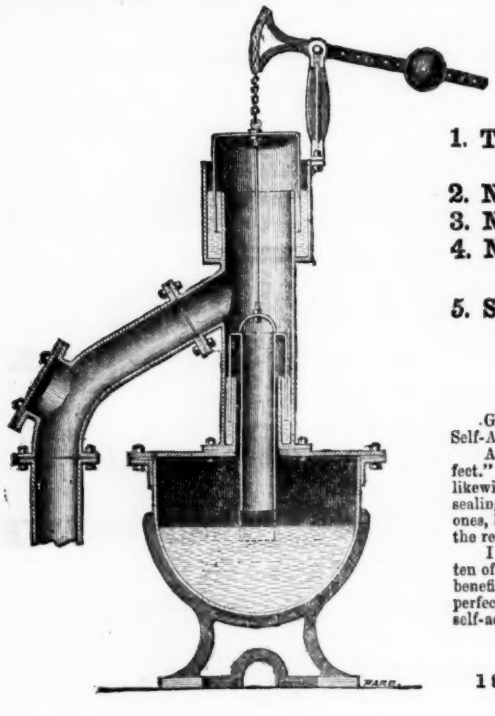
It threads, cuts off pipes, and makes nipples, from $\frac{1}{8}$ in. up to 2 in.

The Splitting of Pipe is entirely avoided.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

19, GREAT GEORGE STREET, WESTMINSTER.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

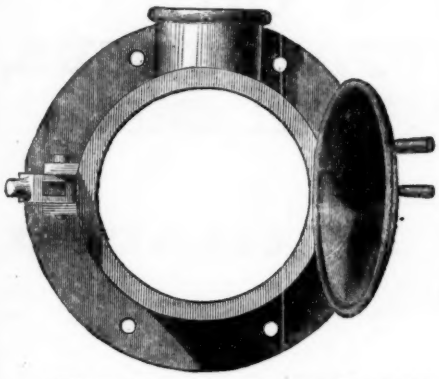
SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS,

ANTI-FRICTION CATCHES, AND ECCENTRIC FASTENINGS.

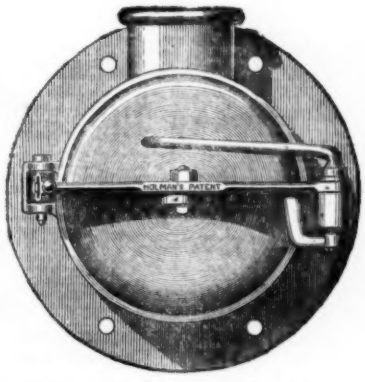


NO LUTING.

NO DUPLICATE LIDS REQUIRED.

INSTANTANEOUS SEALING EFFECTED.

HOLMAN'S NEW SELF-SUSTAINING CROSS-BAR ENSURES FREEDOM OF JOINT AND MAINTAINS PARALLEL POSITION OF THE LIDS.



Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), nearly 15,000 being in use at various Gas-Works in London and the Provinces, among which may be mentioned:—

The Gaslight Co., Beckton (where, by the end of 1875, nearly 4000 will be in use).
" Gaslight Co., Bow Common.
" Gaslight Co., Silvertown.
" Gaslight Co., Lupus Street.
" London Gaslight Co.
" Independent do.
" Phœnix do.
" South Metropolitan Gaslight Co.
" Commercial do.
" Imperial do.
" West Ham Gas Co.
" Gas-Works, Barnet.

The Gas-Works, Royal Arsenal, [Woolwich.
" do. Lower Sydenham.
" do. Brentford.
" Consumers Gas Co., Woolwich.
" Alliance and Dublin Gas-Works.
" Edinburgh do.
" Manchester Corporation do.
" Salford do. do.
" Rochdale do. do.
" Liverpool Gas-Works.
" Birmingham do.
" Birkenhead do.
" Nottingham do.

The Newcastle-on-Tyne Gas-Works.
" Lurgan do.
" Carmarthen Gas-Works.
" Merthyr Tydfil do.
" Windsor do.
" Leeds do.
" St. Albans do.
" Over Darwen do.
" Rotherham do.
" Aylesbury do.
" Bournemouth do.
" Ystrad do.
" Cardiff do.
" Rochester do.

The Keighley Gas-Works.
" Aberdare do.
" Ballymena do.
" Richmond do.
" Stalybridge do.
" Longton do.
" Exeter do.
" Ross do.
" Falmouth do.
" Barrow-in-Furness do.
" Belfast do.
" Wakefield do.
And other Provincial and Foreign Gas-Works.

IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (Commonly called the Chartered Gas Company), Beckton, North Woolwich, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

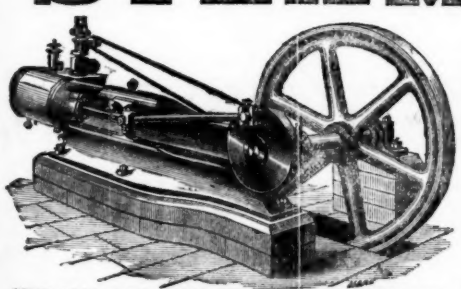
Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,
(Signed) G. C. TREWBY.

TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE

STEAM-ENGINES.



OVER 1300 SOLD SINCE THEIR INTRODUCTION IN DECEMBER, 1869.

In designing this Engine the utmost regard has been paid to simplicity of arrangement, strength of construction, and economy in cost. The working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact, the bed-plate, front cylinder cover, guides, and plummer-block for crank-shaft bearing being all cast in one piece, which in design and proportions is admitted by competent engineers to be perfect, and to afford a strength and rigidity that cannot possibly be attained in the best fitted engines of the ordinary horizontal type. The extraordinary stiffness of this Engine will permit of its being driven at a much greater maximum speed than engines generally, and with far less wear and tear. The cylinder with its valve-chest is bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

These Engines are adopted in Gas-Works at Greenwich (Phœnix Gas Co.), Haggerston (Independent Gas Co.), Nine Elms (London Gas Co.), Falmouth, Harrow, Jersey, Plymouth, Richmond, Rochdale, Santiago (Chili), &c.

NUMBER NOMINAL HORSE POWER	B 2	C 3	D 4	E 6	G 8	H 10	J 14	K 18	M 25
Price of Engine, with Governor	£32	£38 15 0	£46	£70 0 0	£90	£115 0 0	£145	£185	£200
Feed-Pump, extra	3	3 15 0	4	5 10 0	6	7 10 0	8	10	15
Engine and Vertical Boiler on Base-Plate	75	95 0 0	110	150 0 0	180	225 0 0	280	—	—
Engine and Cornish Boiler, with Fittings	—	—	—	—	—	—	—	—	—
Variable Expansion Gear, extra	—	—	10	12 0 0	13	14 0 0	15	16	18

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 22, 1875.

Circular to Gas Companies.

Good progress was made last week by the committee on the Metropolitan Gas Companies (Regulations) Bill, and signs of the end of the inquiry are becoming visible. The case of the associated companies is finished, and there now remains the defence, as we may call it, of the Chartered, who have, to some extent, dissociated their case from that of the other companies. There are also to come the special inquiries with reference to the Bills promoted by the Imperial and Commercial Companies, and the supplementary evidence which the chairman proposes to obtain from one or more of the Revising Commissioners, and, perhaps, the Referees.

We continue our summary, in anticipation of the evidence *in extenso*, and it will be seen that, on Tuesday last, Mr. Cripps, on the part of the promoters of the Bill, made a most important announcement as regards the South Metropolitan Company. We remarked, some weeks ago, that the upward sliding scale, with the standard price of 3s. 9d. per 1000, would give that company a marked advantage over all the others; and, in our last, we suggested that, to put all on something approaching to terms of equality, a lower standard price should be fixed for the South Metropolitan. This the Metropolitan Board have now, as we read the minutes, actually proposed to do, and they put forward 3s. 3d. as the standard price for the company. Now, supposing the Act passed, and the same well-deserved measure of success to attend the management of the undertaking, the company will immediately be in a position to pay $10\frac{3}{4}$ per cent. This is not exactly what the Metropolitan Board intended. With, no doubt, a more tender regard for the interests of the South Metropolitan than for some others, we may be certain that it was never desired to give the company a premium. With the up-and-down sliding scale, and the price of 3s. 3d., this is, however, inevitable, until bad times (good times, we ought to say) come again. How distant or how near these may be, no one can say. Things seem to promise cheap gas for another year, it may be for another two years. But, as it was ably put before the committee by Sir George Elliott, on Friday last, a general revival in the iron trade, which every one desires to see, would immediately send up the price of coal to something like recent rates. We say, then, that to fix to-day a low standard price because coal is falling, would be an unjust and short-sighted policy. We have said before, that, even at the present rates for coal, it will, we believe, be impossible for the large companies to go on supplying 16-candle gas for 3s. 9d., and to fix this price, with a reduction of dividend at the rate of one quarter per cent. for every 1d. per 1000 in excess of it, would be an act of gross injustice. This, no doubt, will be made perfectly clear to the committee, who, should they in the end see their way to recommend this up-and-down scale, will, we hope, couple with it the recommendation of a range of price. A range of 1s. 6d. from 3s. to 4s. 6d., above or below which the dividend should not be diminished or increased, would, we rather think, satisfy all but those who have an invincible objection to a sliding scale of any kind.

We shall probably not have to wait longer than another fortnight for the report of the committee, but whether or not any legislation will result this year may be regarded as doubtful. We cannot think that the sixth clause, even as modified at the suggestion of the Board of Trade, and accepted by the metropolitan authorities, will satisfy the Government, who will see that a compulsory reduction of dividend involves the violation of a parliamentary compact. We have still hopes that the committee will see matters in the same light, and find, in the case put forward by the authorities, no reason for making any alteration in the legislation of 1868–9. To extend that legislation over the whole of the metropolitan companies at once, instead of leaving them to fall under it one by one, may be a desirable object, and to that we hope the present proceedings will lead. The session is, however, fast ebbing away, and, unless grouse shooting is to give way to gas legislation, we do not see how anything is to be done this year.

We observe that the authorities are anxious to extend the provision of section 13 of their amended Bill, so as to have tests made at any hour of the day or night. No metropolitan company will make any objection to the proposal, and we do not suppose the examiners will object to give their whole time to the work of testing, if the authorities will only consider it in their salaries.

The Birmingham Corporation Gas (Purchase) Bill, the most important measure of the kind yet brought forward, is to-day before a committee of the House of Lords, and is practically only opposed by the West Bromwich Commissioners. We have an opinion that the opposition will soon be disposed of, the Commissioners having obtained all they can reasonably want in the House of Commons. The Bill, we can have little fear, will pass as it left the Commons, and the Corporation of Birmingham will soon have the opportunity of trying their hands in the management of a large gas undertaking. We have no doubt of their success, but some of the outlying authorities may be thorns in their sides, if compromises be not made. The best thing these Boards could do would be to buy the mains, leave the Corporation the works, and take gas in bulk.

We are happy to see the price of gas is being reduced in all parts of the country. We have already announced many reductions, and we are glad to publish the fact that the Edinburgh Gaslight Company and the Edinburgh and Leith Gaslight Company have reduced the price 10d. per 1000 feet, the reduction to take effect during the current quarter. We shall, no doubt, at the end of this month, have other important reductions to announce, which will afford convincing proof that companies are quite alive to the claims of consumers.

When, a fortnight ago, we announced a reduction of 8d. per 1000 in price of gas at Dundee, we had not, as we have to-day, the accounts of the Gas Commissioners before us. These are instructive as to the Scottish method of managing public gas undertakings, a method which our readers know we always advocate. The Dundee Commissioners started last year with a balance to the good of £13 17s. 11d. They framed their estimates for the twelve months on the expectation of a normal increase in the consumption of gas, and a corresponding increase in the yield of residuals from an increased make. These expectations were disappointed. Strikes occurred which diminished consumption. The Police Commissioners cut off the supply to lamps which had always been considered public, but were last year decided to be private lights, and thus instead of a production of 275 millions of feet calculated upon, only 269 millions have been made. Furthermore, the commissioners bought some coal which would not produce a saleable coke, and there was some loss on this item.

Thus it has happened that the transactions of the year have left the commissioners with a balance of £2051 17s. 3d. to the bad. The commissioners are, however, by no means discouraged. They frame their estimates for the current year on the present price of coal, and modestly calculate upon a sale of gas only equal to that expected last year. If things go well in Dundee, it may reasonably be hoped that the commissioners at the end of this year will find that they have done more than make both ends meet. It is gratifying to observe the satisfaction that exists as to the able management of the Dundee works in every department.

It is impossible for us to take notice of the mendacious trash which is forwarded to us, but, as regards one statement, we may refer a correspondent to the speech of Mr. George Livesey, reported in another column. Mr. Livesey produces 9750 feet of gas, of 16-candle power, per ton of Newcastle coal, without the use of cannel at all. This will show what reliance can be placed on other statements made in the precious document sent to us.

We commence to-day the publication of the papers read at the recent meeting of the British Association of Gas Managers. Mr. Livesey's paper on Hills's Liquor Process for Purifying Gas is certain to attract attention. It holds out a promise that the complete purification of gas may be cheaply and effectively accomplished in close vessels without nuisance—a consummation devoutly to be wished, and, to our minds, perfectly attainable. There are circumstances, at the present moment, which prevent us from going into the chemical questions involved, as stated by the author, but to which, on a future occasion, we may direct attention. We might here ask whether the labours of Mr. Leigh, of Manchester, on this matter of purification by liquor, ought to be altogether overlooked.

Mr. George Anderson is perfectly at home on retort-settings, and all he writes or says on the subject is certain to be read or listened to with attention. We are in perfect agreement with the author as to furnaces and air supply. Perfect combustion can only be secured by adequate air supply, and this is best furnished *through* the fuel, and not a boveit. The practical hints scattered through the paper will not be overlooked by the managers of small and medium-sized works. Such are, the setting of retorts with a slight dip to the back, and the formation of the floor of the retort-house, which unquestionably offers many advantages. We need say nothing in praise of the combined setting of clay and iron retorts, as recommended by Mr. Anderson.

Mr. Tindall is somewhat exceptionally situated, inasmuch as he uses coal as fuel. A furnace, to consume coal to the best advantage, must necessarily differ from one in which coke is consumed. We have seen furnaces in which the coal was rather distilled than burnt; and, in reality, the combustion of the coke did all the heating work. Mr. Tindall's system, no doubt, obviates this, and causes the complete combustion of the gases given off. With coal, however, much depends on stoking, and on avoiding the overloading of the furnace.

Water and Sanitary Notes.

The Rivers Pollution Bill of this session now promises to be a very simple measure. We think it likely that, when the Marquis of Salisbury undertook to introduce the Bill, and conduct it through the House of Lords, he, far-sighted man as he is, had little idea of the difficulties he would have to encounter. Having now listened to, we do not know how many, deputations—some from manufacturers seeing ruin before them, some from municipal corporations, asking for powers which would, in their action, inflict much additional taxation on the largest ratepayers, but all, more or less, discontented with the Bill—the noble lord seems disposed to convert the Bill into a simple measure to prohibit the throwing of solid matters into streams. It is not, however, the intention of the Government to leave the matter here. The information obtained in these several interviews will, no doubt, be utilized by the Government, and next year we may expect another measure, to be protested against much as this is. The simple fact is, that no measure of the kind can give satisfaction to all parties. It would, no doubt, be a delightful thing to have clear pellucid streams, glittering with fish; but they can only be obtained at a great sacrifice. That already celebrated traveller from New Zealand will, doubtless, sit on the ruins of Salford Bridge and see the river Irwell swarming with trout and salmon; but what will Manchester look like?

Among the deputations who have recently waited on the Marquis of Salisbury was one from the medical officers of health of the north-western counties and towns. When a medical officer of health makes a suggestion, it is often an astounding one, and that made by the spokesman of this deputation was a remarkable instance. It was to the effect that a clause in the Bill should prohibit the employment of *expert* witnesses before the county court judge, and that a Local Government Board inspector should sit as *scientific assessor*. The medical officer, it must be remembered, would act as prosecutor in the case, and the suggestion is that any evidence he might give should be unquestioned and uncontradicted. We venture to say that no Government would dare to entertain such a proposal.

The present Government have an idea that they can afford much alleviation to the constantly increasing burden of local rates, if they give to local authorities the means of borrowing at a low rate of interest. They have accordingly introduced a Bill to allow these authorities to raise money on debentures, the genuineness of which is to be guaranteed by the stamp of the Local Government Board. In return for this guarantee, they wished to have the power of making an annual audit of the accounts of the authorities who raised money in this way. This, however, is regarded as an inexcusable infringement of the principles of local self-government, and the Chancellor of the Exchequer has so far given way to the remonstrants, that he now proposes to limit the curiosity of the Government to the extent that, so long as the loans remain unredeemed, the Local Government Board shall merely have the opportunity of calling for accounts with regard to them. At what rate of interest Corporations expect to raise money by these debentures we do not know, but we have a belief that, to tempt individual investors, they will have to pay more than they would give to a bank or insurance office. There are now so many sound investments, which will yield from 5 to 6 per cent., that we do not expect many people of moderate means will be disposed to lend to Corporations at 3½ or 4 per cent. And then there is a widespread opinion abroad that many Corporations are already practically insolvent. For our own part, we have a fear that cheap loans, if they can be obtained, may lead to extravagance, and we see enough of that already. There is a striking example in the case of Reading, whose Corporation are now seeking power to raise £60,000 to complete their sewage works and lay out a sewage farm. These are legitimate objects enough, but the Corporation have already a debt of £384,000, which looks monstrous for a town like Reading. What can have been done with the money?

The Corporation of Wolverhampton have wisely decided on adding to their water supply, and are about to sink another well into the red sandstone, near the present artesian well at Cosford.

The condition of the water supplied by the Wakefield Water Company has been the cause of loud complaints for a week or two, and, according to report, with some reason. The complainants can hardly be expected to give due consideration to the difficulties of the company, who have made great efforts to obtain an improved supply, but have always been defeated. If the undertaking were in the hands of the Corporation, they could not, with the present means at command, do better than the company. Sooner or later, another source of supply must be procured, and the Corporation cannot do better than lend the weight of their influence to assist the company in their endeavours. In the meantime, we are pleased to see that the company are making efforts to improve the filtration of the only water they can now get.

Reductions in the Price of Gas.—The Tunbridge Wells Company have reduced the price of gas 5d. per 1000. The Bristol United Gas Company have given notice of a reduction of 6d. per 1000 feet, from the 1st prox. At Truro the price of gas is to be lowered from 6s. 8d. to 6s. 3d. per 1000 feet, with a discount of 25 per cent. to all large consumers. This will make the net price 4s 8d. per 1000, and reduce the present price to within 4d. per 1000 of the lowest price ever known in Truro. The Torquay Gas Company have just held their annual meeting, at which they declared a dividend of 10 per cent. on the old shares, 7 on the new, carried £1290 to the reserve-fund, and reduced the price of gas from 5s. to 4s. 6d. per 1000 feet. Reductions are announced in several places north of the Tweed, for which we refer to the letter of our Scotch correspondent.

The Gas Examining Dodge.—Caution to Consumers.—At the Liverpool Police Court, on Wednesday last, John Williams, a young man well known to the police, was charged with stealing a gold watch, value £13, from a bedroom at No. 20, Gambier Terrace. On the 11th inst., the prisoner called at the house, and represented himself to be a person appointed to examine the gas fittings. After he left, a gold watch was missed. A detective officer, who arrested the prisoner, told him he should take him on suspicion of stealing the watch. The prisoner said, "There is no need of your booking me on suspicion, for I stole the watch." The watch was afterwards recovered. A detective-inspector said there were seven cases against the prisoner, and no less than six ladies had called at the detective office and identified the prisoner. The prisoner said he was guilty of two of the charges, but was not guilty of the others. The magistrate said his sister-in-law lived at No. 19, Gambier Terrace, and the man called there with the pretended story about the gas being wrong. The man would go in, although they did not like his looks, he being more like a gaol bird than anything else. Fortunately, his sister followed the man, and there was nothing taken; but it was a most impudent thing. Mrs. Elizabeth Caddow said the prisoner called at her house, and asked to examine the gas-fittings. After he went, the watch produced was missed from a bedroom. The magistrate again remarked upon the impudent pretence of the prisoner by which he managed to obtain access to every room in a house. The prisoner would find it no joke before he saw the end of it. The prisoner was remanded for seven days.

Correspondence.

THE AVERAGE METER SYSTEM.

SIR,—With your permission, I should like to make a few observations on the average meter system, as applied to public lamps.

The system of attaching a meter to 1 in 12 lamps (any other proportion would do; probably 1 in 20, or 25, would be the best for large parishes or towns), and the average consumption of all the meters being the quantity of gas chargeable for each lamp, has been in operation for a number of years in various parts of the country, and with different results. In some few instances it has not been satisfactory, but in the majority of cases it has been highly so, alike both to the gas company or seller as to the buyer or consumer; and whether it is approved of or otherwise by some few persons, no doubt it will be largely adopted in the future as the system of ascertaining the charge for the gas supplied for public lighting. One thing is certain—the old system of contract, based upon a calculation of the hours of burning and the size of the burner, is doomed. The average system is, no doubt, the most equitable one, and when properly understood, and, the prejudice, as there always is against any new thing, has worn away, it will be welcomed by the gas companies as well as by vestries and corporations. When we look back at the prejudices there were only a few years since against the introduction of coal gas as an illuminating agent, we can afford to wait a little, and have some forbearance to those who may differ with us on this point. It must be gratifying to Mr. Rutter, of Brighton, to find that, after the lapse of 20 years, this system, which he then wrote in favour of, is being largely adopted.

Having assumed that the average meter system is likely to be largely adopted, it behoves all persons concerned, either as buyers or sellers of gas, to consider the best means of applying the system.

From time to time various modes of attaching meters to the public lamps have been tried; at one time, hanging a meter on the ladder iron of the column; at another, sinking a well, and depositing the meter therein, and covering the same with a stone; another, having a cast-iron box let into the ground level with the footway, and as is now in use in Sheerness, Nottingham, St. Pancras, Paddington, and other places, and which, for convenience, I will call the plan of "ground meter-boxes." In other places, such as Eastbourne, Birmingham, Brighton, Dublin, &c., they have meters placed in the base of the column, and which I will call the "meter lamp-column."

In some cases dry meters are used, and in others wet. I will, however, not stop to discuss whether wet or dry meters shall be used, but give some reasons in favour of adopting the "meter lamp-columns," in preference to the "ground meter-boxes."

1. With a meter in the column, there is only *one* pipe and *one* connexion *under* the ground; with a "ground meter-box," there are *two* pipes and *four* connexions, and, consequently, the liability of escapes is as four to one in favour of the "meter column."

2. The meters can be more readily got at and inspected—(*a*) for taking the indices; (*b*) for repairs; (*c*) for charging with water, &c. In the case of wet meters being used, it would avoid the necessity of using a pump or syringe to adjust the water-line.

Until October last, the practice usually adopted for adjusting the water-line was to use a syringe. I found this plan tedious and inconvenient, and I, therefore, had a pump made on the principle of a syphon pump, as used in gas-works, and which I find answers the purpose admirably.

3. The charging with water, and the withdrawing the "waste water," can be accomplished much easier and more correctly than in the ground system.

4. Any escape of gas between the main cock and inlet of meter and the burner can be more easily detected and repaired than in the ground system.

5. The meter and fittings, being kept drier, would corrode less, and, consequently, last longer and require less for repairs.

6. There can *always* be a *fall* from the stand-pipe to meter, and from the meter to the service—a thing very desirable, but not always attainable in a "ground meter."

7. The facility and ease with which a meter can be fitted, removed, or adjusted.

8. The taking of the states of the indices could be more easily and expeditiously accomplished; 50 meters in columns could be easier taken by the inspectors alone, than 35 with the assistance of two men, in the case of "ground meters;" and when the frost sets in, it is necessary to have three men to open and shut the lids.

9. That when testing the lamp meters *in situ*, the test meter can be at the same level as the lamp meter being tested—a matter impossible with ground meter-boxes.

10. Much trouble and annoyance is occasioned in frosty weather when raising the lids of ground meter-boxes. This would be avoided by using the meter column.

11. That the cost would exceed but little, if any, the ground box, as the old shaft could, if desired, be utilized; or, if entirely new columns were supplied, the old columns would realize something as a set-off to the cost.

To ensure success in working, the meters used should be of a sufficient size, say an ordinary 3-light; the base of the column should be sufficiently large, not less than 14 inches by 14 inches on plan.

The meter should be enclosed in a case, in addition to the column, as a protection against the variations of temperature.

The service should be provided with a tee and plug *before* the main cock, for clearing the service, without the necessity of disconnecting the meter.

I shall anticipate one objection which might be suggested against the use of the "meter column," and that is, the meter would be liable to be affected by the vibrations caused by heavy traffic. This I believe to be more imaginary than real, and I have no doubt this objection can be entirely removed and overcome by placing the meter on say five or six layers of horsehair, felt, or other similar arrangement.

G. CLUTTERBUCK,
St. Pancras, June 18, 1875. Inspector of Public Lighting.

RIGHTS OF GAS COMPANIES.

SIR,—I agree with "An Ex-Secretary," that gas companies do not possess any privilege over ordinary traders in the recovery of accounts due to them when the debtor is insolvent and has filed a petition. Will any of your readers who think to the contrary kindly state the reasons for their belief?

I have carefully looked through the sections of the Gas-Works Clauses Acts, 1847 and 1871, relating to the recovery of rents, &c., and fail to find any words which can be construed into giving gas companies power to recover in full the amounts due to them. The opinion of the London magistrate was probably founded upon the wording of the Phœnix Company's Act, and given without a full consideration of the subject.

Incorporated companies already possess a considerable advantage over ordinary traders, in the power which is given them for the summary recovery of debts before justices. I have known tradesmen who were not a little astonished when they have been made to "sit up," under the operation of this summary power of recovery; they had reckoned on the leisurely process of the county court being taken against them.

I am connected with a company which was incorporated previous to the passing of the Gas-Works Clauses Act (1847), and whose Act contains the following clause for the recovery of rents:—"That if any person, supplied with gas by virtue of this Act, shall neglect to pay any rent or charge due to the company, it shall be lawful . . . . to levy by distress the rent or charge due from such person, if less than £30, together with the expense of cutting off the gas and costs of recovering the same rent or charge, and any justice may issue his warrant accordingly." The company were advised by counsel that the magistrates were bound to summon and hear the defaulter, before issuing a warrant of distress. That where such warrant had been issued, and seizure had been effected without sale, before an act of bankruptcy, it would be effectual, and place the company in the position of a secured creditor. That a distress warrant could not be executed after a petition was filed, and before the first meeting of creditors, because the title of the trustee, under a liquidation by arrangement, dated from the presentation of the petition. Neither could the company, in case the creditors agreed to accept a composition, enforce their remedy by distress, in the event of their having obtained an order before the confirmation of the resolution passed at the first meeting of creditors, as neither the date of the first resolution, nor that of its confirmation, will affect the time at which the property is to be protected for the benefit of the general body of creditors.

I would suggest that, as this question is one of considerable importance to a large number of gas companies, the Gas and Water Companies Association is a fit and proper body to obtain a decision upon it in some shape or form. H. T.

Parliamentary Intelligence.

METROPOLIS GAS COMPANIES BILL.

On Monday, the 14th, after the adjournment for the preparation of a clause to carry out the concession of the promoters as to a sliding scale of price and dividend, Sir E. Beckett resumed and concluded his opening address on behalf of the associated companies. Referring to the clause just submitted to the committee, and to a remark by Mr. Cripps, that the promoters intended to propose a special clause for the South Metropolitan Company, limiting them to a lower maximum than the other companies, Sir Edmund sarcastically observed that he thought the boasted aim of the promoters was uniformity of legislation; but with them "uniformity" appeared to be cutting everybody above the lowest figure down to that standard, and having a special whip for the lowest man. This was the reward given for due care and management. Anything to get rid of revision—anything to make gas companies suffer when all the rest of the trading population did not suffer. As to the auction clause suggested by the Board of Trade, he looked upon it as the beginning of a new, and, to his mind, pernicious system of legislation, if the committee accepted it. It was the first time he had ever heard of the head of a department in the Government officially dictating to a committee what ought to be introduced into a bill. Dealing with the clause in another way, he denied that it would be fair to impose it upon the companies. Its effect would be to give the public, as against the shareholders, the benefit of any premium on the shares. The shareholders would suffer the deprivation of that which they were entitled to by the general law, which said that when shares were at a premium they should be issued to the shareholders, unless Parliament should otherwise order it. This was a general law, which was found to work advantageously, while the proposal to compel the sale of shares by auction was only another mode of confiscating existing rights. In fact, to depreciate the value of the property of gas companies was almost the avowed object of the bill. And, moreover, the committee were asked to pass the bill in the face of the regulations of two committees, presided over by Mr. Cardwell, and in the entire absence of any legislation or precedent for the scheme. He felt persuaded that the committee would not comply with the prayer of the promoters. He concluded by referring to the complaints that the metropolitan companies raised the price of gas during 1873, and said it would be proved in evidence that throughout the country there was a pretty general rise in price during that year, whether the supply was in the hands of companies or corporations.

Mr. St. George Burke, formerly governor, and still a director of the Imperial Company, was then called, and examined at great length with respect to the past history of that company, and the various legislative schemes affecting them, and the metropolis gas supply generally, from 1860 downwards. He stated that having had opportunities of judging as to the results of all this legislation, he was persuaded that the Act of 1860 was far more favourable for the public, as well as the companies, than that which had since taken place. With regard to the three bills promoted this year by the Metropolitan Board, he characterized the Competing Works Bill as "pure nonsense," intended only to act as a threat to the companies and reduce the value of their shares, and a measure which only excited ridicule, and had to be withdrawn the moment it saw the light. As to the Purchase Bill, as soon as it was submitted to the judgment of men of common sense it was seen to be impracticable, and was ignominiously sacrificed. Turning to the third bill—the one now before the committee—he said the board tried to get the support of the Government for it, but its principal clause was so dishonest that the Government declined, and intimated that they would not allow the bill to pass while that clause remained. If any alteration in previous Acts was

required, it must be totally different to that now proposed, and something that was consistent with common justice. In cross-examination upon the auction clauses, he said they were not particularly fair, as under them they would be giving to the public the goodwill attaching to and belonging to the companies.

On Tuesday, at the opening of the proceedings, Sir E. Beckett, as representing the South Metropolitan Company, asked the promoters what proposal they intended to make, after the intimation of Mr. Cripps, as to the mode of dealing with that company, and Mr. Cripps replied that his present impression was that the initial price of the South Metropolitan should be 6d. below that of the others. As to the sliding scale, however, they would be dealt with in precisely the same way as the others.

Mr. St. George Burke was then recalled, and his cross-examination continued. He stated that under the Act of 1860 the companies had power to charge 4s. 6d., beyond which, if they required to go, they must give certain notices, and in the event of the local authorities objecting, the matter was subject to arbitration. If the local authorities did not object, or if the companies were successful in their arbitration, they might charge as high as 5s. 6d. The initiative with reference to raising the price was with the companies, and the onus of resisting the increase upon the local bodies. The companies, knowing that they might be subject to arbitration, would naturally abstain from seeking to raise their price, unless they were convinced that they had a good case to present; the local authorities, also, unless they felt confident in their position, would not enter upon an opposition. This arrangement was widely different, and worked much better than the expensive machinery of revision provided by the Act of 1868. Referring to the Imperial Company particularly, he said there was a great deal of competition among coalowners to supply them, and the company were able to deal favourably for their purchases. The manufacture of gas was, and ought to be, carried on by that company as economically and well as by any other company in the metropolis. They were perfectly cognizant of the system of manufacture adopted by other companies, and they took advantage of everything that might tend to produce economy and efficiency. The manufacture of gas was pretty well known, and an examination of the Imperial Company's accounts, and those of other companies, whether in London or elsewhere, would show that, considering their position, they were working equally well. Since he had been a director the company had carried on their operations so efficiently that they had been able to reduce the price of gas from 9s. to 3s. 9d. If that was not evidence of good working he did not know what was. The same motive that had all along influenced them would still operate to reduce the charge below 3s. 9d.—viz., to manufacture gas at the cheapest rate, believing it to be advantageous to themselves as well as to the public. But they had a duty as trustees to their shareholders, and when the price of materials and labour went up to such an extent that they could not maintain their dividends, they were obliged to apply for a revision. This year, although it was doubtful whether at 3s. 9d. they could do so, they had run the risk, although they might have gone before the commissioners for such a price as would have ensured the maximum dividend and the filling up of the reserve-fund. The reductions in the price of coal proved that they had acted wisely in this respect. The price of coal had been continuously falling since 1874, but it might go up again next year to a very high figure, for it depended upon the iron trade and many other things. Both the public and the companies ought to be considered in the raising of new capital, and Parliament always did consider each interest. One of the first duties of a gas company was to raise capital on such terms as would enable them to do it with certainty. They should have power given by Parliament to do this. If a company had made a large business by their own exertions, they should be enabled to raise money on such terms as would, to a certain extent, represent the value of their property. In 1869 Parliament recognized 7 per cent. as a fair rate at which to raise their new capital. At one time there was a difficulty in raising it, but afterwards it was raised with ease. In re-examination witness said 7 per cent. was the lowest rate that, in his experience, Parliament had ever fixed. If the Metropolitan Board wished to get hold of the contingent rights of the shareholders, they must buy the whole concern at a proper price. He had never known an instance in which a corporation or other public body had been allowed to reduce by compulsion the contingent rights of shareholders in any concern, any more than their absolute rights. With reference to ligislation for regulating the companies, he had not the slightest doubt that the machinery of the Act of 1860 was far better than that of 1868–9. It was said that the Act of 1860 was described as one which had been unduly favourable to the companies. The truth was that, in consequence of its provisions, there was a fall of nearly half a million of money in the price of gas all over the metropolis. The public benefited to the extent of £50,000 a year in the Imperial Company alone; and, taking the whole of the companies together, it was in evidence that gas was reduced to the extent of £300,000 a year. That Act had nothing to do with enabling the companies to pay maximum dividends. There had never been any attempt on the part of the Metropolitan Board, or of the vestries, to see what that Act would do for them. He had never known his company charged with any misfeasance of their parliamentary obligations. Witness also, in reply to the chairman, said no doubt Mr. Cardwell, by his legislation, intended to deprive the company of the reserve-fund. They declined to accept his proposition, and the next committee they went before gave them the power they wanted. With regard to the sliding scale, up and down, he did not see how it could work, and he hoped sincerely the question would never practically arise. Without assuming to lay down the law in the case, he would say off-hand that the 7 per cent. shareholders (under the proposed clause) would have no right to participate in the increased dividend. There would be no difficulty in the case of a diminished dividend, because, so long as the 10 per cent. shareholders were receiving 7 per cent., the others would not take less. The chairman remarked that in that case the object of the clause would in itself be defeated. The company would receive less dividend if it charged more price; and he supposed it would not be considered fair that, because they happened to have raised part of their capital at 7 instead of 10 per cent., they should have a less proportionate diminution in the dividend than another company by their side. Witness said the clause was full of difficulties, and the more they considered it the more unmanageable it would be found. A more inexpedient clause for the Metropolitan Board of Works could not have been devised. He was not asked to give evidence on behalf of that body, but that was his opinion. They found they could not pass their own clause, so they took up Mr. Farrer's crotchet. Speaking as a shareholder, but not on behalf of the general body of shareholders, if the companies could ensure finality, and that the Board of Works would keep faith with them, he would say, "Grant the sliding scale at once, and we will accept it." He was convinced in his own mind that, in course of time, gas would go down, and that it would be to their advantage. With reference to buying the companies up on the average price of their shares during the preceding three years, he had never heard of such a proposal before, and assuredly Parliament had never sanctioned it.

The next witness was Mr. Chubb, secretary of the Imperial Company, who deposed to the course adopted by them in the purchase of coals. They were in the habit of inviting public tenders for the supply of coal, finding that contract was the best means of procuring it cheaply. They had adopted this course for the last five or six years, and had found it work well. In mid-winter they used no less than 2300 tons of coal per day. That would be the consumption next winter. It would be impossible to get the large deliveries of coal necessary in the winter months, unless they had contracts which stipulated for certain monthly deliveries throughout the winter. They could not possibly be dependent on going into the market and picking up stray cargoes from time to time. In continued examination, witness detailed the expenses of lightering and carting coal to the company's works. With regard to residuals, a chaldron of coke was produced for each ton of coals; but, in round numbers, of the chaldron so produced, one-third was used for fuel, leaving two-thirds for sale. Their object was to sell coke as soon as possible. It was a tender product, and, if it were kept for any length of time at the works, it deteriorated, and a large quantity of it went to waste. Witness was examined as to the advantages of the several stations of the company for obtaining coal and disposing of residuals, and said he could suggest no better mode of dealing with the latter than that which for years had been adopted by his company as the result of experience. He handed in a table, showing a comparison between his company and the South Metropolitan, and the average of all the other companies, as to the first cost of coal, the receipts for residuals, and the net cost of coal per 1000 cubic feet during the five years ending in 1873. He produced also another table giving a statement of the working expenses of the several companies during the same period. He stated that the South Metropolitan Company had many advantages over the other gas companies. They had a neighbourhood in which they could sell their coke better, and they had no competition from surrounding companies. The South Metropolitan had a ready sale for their coke at their works. People came and took it away, and they were not put to the necessity of delivering out by contract. In the case of the Imperial it was very different. At St. Pancras they even had competition by the railway, for a great quantity of coke was brought from country places where there was no demand for it—Nottingham, for instance—and sold it cheaper than the Imperial Company could offer it at. The estimated cost of increasing 14-candle gas to 16 was 3d. It was an impossibility, in the case of the Imperial Company, to supply 16-candle gas at 3s. 9d. There are three companies under the revision—the Chartered, the Imperial, and the South Metropolitan. The Chartered charged through the so-called coal panic 4s. 1d., the Imperial 3s. 11d., and the South Metropolitan 3s. 1d. He handed in a table in answer to Mr. Livesey's statement, that all the companies could supply gas at 3s. 9d. and pay full dividends, showing that in the case of the Imperial Company it could not be done under 4s.0·69d. In cross-examination he said he thought the South Metropolitan Company might probably purchase coals more advantageously than the Imperial, not requiring to buy such large quantities, and having advantages for bringing them to their works beyond those possessed by the Imperial at any of their stations, except the new station at Bromley. But, upon the whole, he expressed his belief that the South Metropolitan did not actually work cheaper than the other companies. In answer to the chairman, he said if the various schemes of the Metropolitan Board and other parties from time to time had become law, the gas companies would undoubtedly have been damaged, but Parliament had protected them from the effect of these agitations, so that none of the bills that had passed interfered with the capitals of the companies, nor the dividends already secured to them. As to the sliding scale now before the committee, he thought it highly objectionable, and believed it would lead consumers to quarrel with the companies, not because of the price charged for gas, but because of the dividends the shareholders earned. If the companies lowered the price of gas, and raised their dividends, the howl against them would certainly grow in virulence. He believed also that shareholders would rather have a fixed statutory dividend than a fluctuating one.

On Wednesday, Mr. Chubb was recalled, and cross-examined by Mr. Cripps. He explained that the outlay of capital by the Imperial Company at Bromley was not yet remunerative. When the works there were completed, the company would be in a much more favourable position than at present. The saving, too, in the cost of coals would be equal to 13d. or 13½d. per ton. The site was chosen with a view to economy in that matter, but it would be some years before the full benefit was realized. He differed with Mr. Burke as to the future price of gas, which he believed would increase rather than diminish. It depended very much upon the cost of coal and labour, and he feared that these would overwhelm all the advantages to be derived from their new works. Coke was also an increasing difficulty, because, as the demand for gas increased, the production of coke and the difficulty of getting rid of it increased also. In 1854 the company realized 15s. for coke; in 1871 they realized only 6s. 9d. During the coal famine, and since that period, the price had increased relatively to the cost of coal. The increase in the consumption of gas was, in 1869, at the rate of 5 per cent., and in 1870, when the price dropped to 3s. 9d., it was 6·2 per cent.; whereas, in 1874, when the price of gas was raised on revision, it was 3·7 per cent. The company's works were not large enough for the heaviest day's consumption. If they were bound to meet an extreme demand, only occurring seldom, a large amount of unproductive capital must necessarily be engaged in the undertaking. The largest demand in any one day had been 21 million cubic feet, and the smallest 3 millions. Witness was cross-examined at some length as to the working of the Act of 1869, and expressed his belief that, even when earning 10 per cent., they could go

to the Revision Commissioners to make up their reserve-fund. As to the sliding scale, he thought that at whatever price gas was sold, the company would be afraid to divide 12 per cent. as dividend. The agitation going on did their property more harm than anything else, and people complained that 10 per cent. dividend was paid to the shareholders. It was true that in a time of panic the company raised capital at 10 per cent. to pay off bonds then coming due, and this action of theirs, however it might be regarded now, was sanctioned by Parliament in the Act of 1869, and no opposition was raised to it by the Metropolitan Board. The company possessed power to raise money on debenture stock; but had never done so for the purpose of paying off bonds falling due. It would undoubtedly be wise now to begin to do so. In re-examination by Mr. Venables, he said if the company could get coal cheaper, the consumers would be benefited. The company was working at a less cost than the South Metropolitan Company, and that was arrived at by careful management. There had been no legislation which had affected the dividends of that company, but if the Metropolitan Board of Works had succeeded with its gas bills, the company would have been injured; but Parliament had on every occasion stepped in and preserved them their statutory rights. As to coke, there was no sale at Bromley for coke, because there was no local demand. Bromley was convenient for coal, but never would be a market for coke. The Chartered Company at Beckton was in the same position, and competed with the Imperial in the disposal of coke. In 1869 the company had a surplus of £44,728, and then they took off 3d. from the price of gas, and the result was that the surplus was reduced in a year to £2664. The reserve-fund involved no loss to the consumers, and if coals were cheap the reserve-fund would be made up without increase of the price of gas. The reserve-fund balanced itself. Sometimes it had to be made up by increased prices, and then, when the fund was at the full amount, prices were lowered. With regard to capital account, every farthing of the money raised under the Act of 1866 was spent in works. In reply to a member of the committee, he stated that the company had £713,487 invested in street mains. If the company had now to commence their works anew, they could not construct them for less money than they had cost on capital account. It might be desirable to have a depreciation-fund, but the company maintained their works out of the current revenue of the year. The official auditor at the present time had no power to allow a depreciation-fund. The price of coal now was exceptionally low; there was a glut in the market, and the iron market was in a precarious state; it was doubtful whether the present price would continue; his own impression was that it would not. If the present price continued (15s. 6d. into the works, and 7s. 6d. net) the company could sell gas at 3s. 9d., with a very good surplus—probably £40,000 a year.

Mr. T. N. Kirkham said he was engineer-in-chief of the Imperial Gas Company. He had been a gas engineer for thirty years, and knew all about the manufacture of gas. He had entire control of the works, and had resident engineers under him. With regard to the necessary new works, he reported to the directors what was wanted. He believed that the works belonging to the Imperial Company were most carefully managed. Every new invention for the improvement of gas was watched and tested; but alterations were not always improvements. The company tried their very best to sell their coke to the greatest advantage. He remembered the visit of the commissioners to the works at Bromley, at the time of the revision. He accompanied the commissioners, who asked him from time to time all sorts of questions relating to the outlay upon the works, which he answered. In 1872 the cost of manufacture rose something like 15 per cent.; that state of things had continued, and he anticipated would never be reduced again so far as coal and labour were concerned. The increase in the cost of iron was about 30 per cent., but that had since been diminished. Every means for effecting economy were adopted by the company, and every new invention that give promise of success was tried. In cross-examination, witness stated that the outlay to the present time at Bromley was over £800,000, and the make of gas there about 1¼ million feet per diem. The works were designed for a much larger production when completed.

Mr. Richards stated that this evidence completed the Imperial Company's case.

On Thursday, the first witness was Mr. Edward Horner, chairman of the Phœnix Company, who stated that they were still under the Act of 1860, and objected strongly to the legislation proposed in the present bill. The company had carried on their business satisfactorily alike to the shareholders and the public, and the complaints from the latter, during the last 15 years, had been very few indeed. The company paid 10 per cent. on their old capital of £540,000; 7½ per cent. upon £360,000, authorized by their Act of 1864; and 5 per cent. on £144,000 of capitalized profits. The first and principal objection he had to an up-and-down sliding scale was that it involved an absolute breach of the contract Parliament made with them, upon the faith of which the capital had been raised. Witness was examined at length respecting the prices charged, and the dividends paid by the company over a series of years, the cost of coal, &c., and as to the general working of the undertaking. He was cross-examined by Mr. Cripps, who elicited the fact that the districts of the Phœnix and South Metropolitan Companies ran parallel to each other, and that, on the boundary between, the charge for gas on one side of the road was 4s., and on the other 3s. The districting arrangements had produced great economy of working, and the result of them, as sanctioned by the Act of 1860, coupled with a cheap supply of coals, had enabled the company to pay 10 per cent. The capitalized profits represented money which might have been divided, but was laid out in works, as proved before Parliament in 1864. The company had since raised £145,000, by bonds at 5 per cent., so that the average profit divided had only been at the rate of 6¼ per cent. There had been a state of prosperity since the districting arrangements, and that prosperity would continue if the local authorities would not interfere with them. If the present bill, with its standard of 16-candle gas, should pass, he did not think the company would continue to earn statutory dividends. If the sliding scale was adopted, and under it the companies increased their dividends, his opinion of the morality of the Metropolitan Board was that, in the next session of Parliament, they would apply for the repeal of the Act. In re-examination he stated that, while the Act of 1860 benefited the companies, by enabling them to get a more certain, and even an increased dividend, it benefited the consumers by giving them a reduction in the price of gas. The company had the right to complete their reserve-fund, in addition to paying full dividends, before making any reductions in the price of gas; but, as a matter of fact, they had over and over again reduced the price, with the reserve-fund at less than half its amount. A very large proportion of the present capital had been called up since 1860, to meet the constantly increasing demand for gas. In answer to the chairman, he stated that he attributed the difference between the price of the South Metropolitan and Phœnix gas to the difference in the amount required to pay dividends upon the respective capitals. He believed, as far as cost of manufacture was concerned, the Phœnix were lower than the South Metropolitan. The former company had still some authorized share capital unissued, and also further borrowing powers, so that they would not be under the necessity to come to Parliament for some years; and, that being so, he thought, with Mr. Cardwell, that they ought to be exempt from any legislation now.

Mr. Corbett Woodall, chief engineer to the Phœnix Company, was next examined with reference to the general working of the company, and, in the course of his examination, the chairman intimated that the committee did not think it necessary to bring out further facts with regard to the actual management of the business. They were prepared to admit that there seemed no proof, as compared with the South Metropolitan, of want of due care and management, so far as the manufacturing business was concerned. In cross-examination, witness said the capital of the company per 1000 feet of gas made had fallen from 1869 to 1874 from 19s. 8d. to 16s. 0·07d. He attributed this chiefly to the increased consumption, and in some slight degree to an increase of the quantity of gas sold per ton of coal. He thought they might look for a still further diminution. The company were not in a favourable position for the storeage of coke, and the demand for it in the neighbourhood of their principal station was not large, but as a rule they sold nearly 80 per cent. of the coke made, whereas the South Metropolitan Company sold about 70 per cent. The reason they were obliged to charge more for gas was the larger amount of capital invested, upon which dividend had to be paid. He believed in the current year there would be a reduction in the amount required for dividend as compared with former years, but when a fresh outlay of capital took place, as would hereafter be necessary, the difference would be the other way. In answer to the chairman, he said the improvements in gas manufacture had not in all cases tended to cheapen its production. Recent improvements in purification had indeed proved very costly to the companies. With reference to the sliding scale, he objected that it might introduce an element of gambling, which was not at all wanted. The competition already existing between the companies was very keen; they all strove their utmost to reduce price, and under the proposed state of things there might be an attempt to show fictitious profits in order to secure the advantage of a higher scale. The present dividends were regarded by the companies as satisfactory, and the existing state of things gave a very great stimulus to economy. There was nothing like a guarantee of dividends, irrespective of due care and management, and he did not think it would be an advantage to put the companies on the same conditions of profit and loss as those which applied to manufacturers generally. It would be a suicidal policy for companies, apart from the dishonour attaching to such a proceeding, to issue capital unnecessarily for the purpose of securing dividends upon it. The constant effort of his company was to prevent the concern being overweighted with capital. The directors always felt that, as the absolute value of their plant was increased in proportion to the business done, so was its stability and value to them increased. He thought there would be less objection to the proposal of a sliding scale if there was a margin left within which it should not operate—say that the dividends should not be diminished until the price charged for gas was above 4s., and that it should not be more than 10 per cent. till the price went below 3s. 6d. The inducement to economy would thus still remain, while the element of unfairness of taxing the companies for temporary variations in circumstances over which they had no control would be removed.

Mr. Rohde Hawkins, governor of the London Company, followed. He said the expenditure in every part of the works of his company was accurately investigated and laid before the board every week. They had only one station, but it was customary to carefully compare their present workings with those of previous years and with the workings of other companies. Every possible care and economy in the manufacture of gas was now exercised. He took, he said, precisely the same position Mr. Horner did as to the Phœnix, except that he thought he had a stronger ground—*i.e.*, that whereas Mr. Horner and some of the other companies were under the legislation of 1860, his company, as late as 1866, was before a committee of the House of Commons, of which Sir John Trollope was the chairman, for a private bill. They had heard that he was not very favourable to gas companies, and yet, after the closest examination of their position, the committee enabled them to raise something like £400,000 more capital. Therefore, he held that taking the Act of 1860, supplemented by the larger power of the Act of 1866, their position was an exceedingly strong one, and anything that interfered with it would be more unjust to them than to the other companies. It had been stated that under a clause of the Act of 1866 the London Company were bound to adopt the legislation of 1868, because that clause provided that if four or more of the twelve other companies came under certain provisions, the London Company should come under the same limitations as to price and illuminating power. He could not see how it could be, because the clause referred to said they should reduce their price for the same kind of gas to the average of the maximum price to which these four companies were subjected, whereas the companies affected by the legislation of 1868 had, in reality, no maximum price, but a price named, subject to revision.

Mr. Rohde Hawkins was recalled on Friday morning, and said the London Company maintained that they were still under the Act of 1860, which prescribed an illuminating power of 12 candles, and a 4s. 6d. maximum. He objected to the terms of the present bill, by which it was proposed to alter the legislation under which their capital was raised. The standard of illuminating power ought not to be higher than could be attained by the use of common coal. With coals and products at their present price, his company might be able to supply gas at 3s. 9d. The price would be reduced as the price of coal went down, and the company got free from the legal expenses of this inquiry. In all mercantile manufactures the freer a manufacturer was left, if he was an honest man, the more economically and the more to the benefit of the

public would be work. His opinion was that free labour was very much better than slave labour, and, if the directors were careful men, the public would gain in proportion to the freedom the companies were allowed in their operations. He objected to the policy of turning the Metropolitan Board of Works into a public auditor to audit the accounts of the gas companies, and maintained, on another point, that the bill before the House, if allowed to pass, would have the effect of preventing the company from maintaining their reserve-fund. Witness was cross-examined as to the effect of the special clause in the London Gas Act of 1866, to which his attention was drawn on the previous day. The sliding scale proposal he regarded as a breach of the engagement between the companies and Parliament. His company did not object to be put under certain regulations, but they objected to the provisions of the Acts of 1868-9, and they objected to the suggestion that they should be required to raise their already authorized, but unissued capital at a lower rate than that fixed in their special Act. One reason why their capital was the highest of any, except the Chartered, was that the works were originally built on leasehold land; and, when the lease expired, they had to purchase a new site, and erect entirely new works. Formerly, too, they had to compete with the Imperial Company. In answer to the committee, he stated that the prosperity of the company, of late years, arose from the absence of competition, and to the fact of superior management. The proposed new legislation would introduce an element of uncertainty, and, if it operated favourably to the companies, the Metropolitan Board would try to break the agreement Although the London Company had a large capital, it was at a low rate of interest, and year by year the proportion of capital to rental was diminishing. The present annual increase in the production of their works was about 6 per cent., and would be so for some years to come.

Sir G. Elliott, M.P., a large coalowner and mining engineer, said for the last 30 years he had supplied gas companies with coals. For many years prior to 1870 there was remarkable uniformity in the price of coals used in gas manufacture. After that time new circumstances arose which raised the price of all kinds of coal. It was a very bold statement for Mr. Stevenson to make when he predicted that the price could never rise again. Witness thought it was certain to do so; in fact, he should decline to take contracts at present prices beyond the current year, and had actually refused a contract for 100,000 tons extending over 1876. He thought it would be wrong to tie companies down to a fixed price for gas, unless it was a very high price. Should the iron trade revive, gas coal would certainly advance in price. He did not anticipate any reduction in wages. The adoption of a sliding scale would be a bad bargain for the companies.

Mr. C M. Palmer, M.P., said his firm supplied a large quantity of coal to the London market—25,000 to 30,000 tons per week, about a fourth of which was gas coal. He was familiar with the wages question as connected with collieries. Looking at the existing state of things, it was very difficult to predict the price of coal for any length of time. He agreed with the last witness that, though for a year or two no great advance might take place, the iron trade, when once it recovered, would soon take up the supplies, and there would be a rise.

Mr. R. Morton, engineer-in-chief of the London Gas Company, deposed to the working of that company, and stated that they exercised all possible care and management in the conduct of their affairs in the purchase of coal, the manufacture of gas, and the disposal of residuals. He did not think it possible to work more economically.

The last witness called was the publisher of this JOURNAL, who handed in a table showing the advances made in the price of gas by metropolitan and provincial companies, and by local authorities supplying their respective districts, during the year 1873, being the first year in which the revision clauses of the Act of 1868 were brought into operation.

Mr. Richards then stated that, although he had not exhausted his evidence, and might have called witnesses on behalf of the Surrey Consumers, Independent, and other companies, he thought the committee had had a thorough insight into the position of affairs, and he was unwilling to do anything that might appear to overload the case.

Mr. Pope stated the position of the Commercial and Ratcliff Companies, for whom he appeared, and said he should refrain from calling evidence on the bill of the Metropolitan Board, reserving his case until the bill promoted by his clients was before the committee.

Yesterday Serjeant Sargood opened the case for the Chartered Company, and had not concluded his speech when the committee adjourned.

HOUSE OF LORDS.

MONDAY, JUNE 14, 1875.

The following bills received the Royal Assent:—Greenock Water, Ashton-in-Makerfield Local Board, Cleethorpes Gas, Hindley Local Board, Oxford (Corporation) Water, Pemberton Local Board, Pontypridd Water, Colchester Gas, Worksop Water, Ashton-under-Lyne, Stalybridge and Dukinfield District Water, Ossett-cum-Gawthorpe Local Board, Rotherham Corporation.

The LORD CHANCELLOR acquainted the House that no further Standing Orders are applicable to the Weardale and Shildon Water Bill.

The Market Rasen Water Bill was reported, without amendment.

The Waterford Improvement, Birmingham (Corporation) Gas, and Birmingham and Staffordshire Gas Bills, were read a second time, and committed.

The Leicester Water and Rochdale Improvement Bills were read the third time, with the amendments, and passed.

The Broadstairs Water (Nos. 1 and 2) and Longwood Gas Bills were referred to a select committee, consisting of Earl Camperdown (chairman), Viscount Powerscourt, Lord Digby, Lord Sherborne, and Lord Oxenfoord; to meet on Wednesday, June 16.

BIRMINGHAM (CORPORATION) WATER BILL.

On the motion for the second reading of this bill,

Lord HAMPTON said he rose to call attention to the omission on the part of the Corporation of Birmingham to comply with the requirements of the 63rd section of the Birmingham Improvement Act, 1851, and to move that the bill be read a second time that day three months. This was a bill to enable the corporation to take a course which was altogether unusual—namely, to purchase arbitrarily the works of the Birmingham Water-Works Company, against which no complaints had been made in the long period of years during which they had supplied the town with water. The promoters did not allege any necessity for depriving the company of those powers which they had hitherto exercised. On the contrary, he could show good reasons for allowing those powers to remain unaltered and unimpaired. In 1851 a bill was passed called the Birmingham Improvement Act, in which a clause was inserted, with the consent of the water-works company, empowering the corporation to purchase the company's works by agreement or at a price fixed by arbitration. In 1854 the corporation gave notice of their intention to act upon that clause, but they never took any further step upon that notice. The company were advised by Mr. Mellish—now Lord Justice Mellish—that the powers of the council for the compulsory purchase of the works no longer existed, but were limited to seven years from the passing of the Act; but, however that might be, the powers were given for the purchase of the water-works as they then stood, and since then, at an outlay of £600,000., the extent of the works had been more than doubled, and, therefore, the purchasing clause of the Act of 1851 could not be applicable to the circumstances at the present moment. He would not then discuss the water supply of Birmingham, or the motives of the corporation in desiring to put an end to the power of the water company, because those were questions for committee, but would show why, in his opinion, the bill ought not to be allowed to proceed further. He rested his opposition to the measure mainly on two grounds, the first of which was that there was not a single parliamentary precedent for enabling a corporation to seize the property of any company against its will, and further laying down, as the bill did, the price which was to be paid for the property. The powers of the Act of 1851 were in the form in which such powers were generally granted. The power of purchase was given to the corporation, but the price was to be fixed by agreement, or, if the parties could not agree, it was to be determined by arbitration. There was no such provision in the present bill, but arbitrary power was asked to take the property by compulsion, and to fix a price within the clauses—a price to which the company were no parties. That was so complete a deviation from the principle of justice and the practice of Parliament as to constitute in itself a sufficient reason for refusing to read the bill a second time; but there was another reason to which he attached still more importance. In the Birmingham Improvement Act of 1851 there was a clause providing that no application should be made to Parliament by the council for further powers or for power to raise a further sum of money for the purposes of the Act, without the previous consent of the ratepayers, expressed at a meeting of which notice should have been given for two consecutive weeks in at least two newspapers published in the borough. This had not been done. Neither House of Parliament had any right whatever to disregard the clauses of an Act of Parliament, and treat them as if they did not exist. This matter was the subject of a special report from the committee of the House of Commons. For reasons which were quite insufficient they consented to condone the omission, but they made a special report on the subject, which gave the Chairman of Committees the opportunity of calling attention to this extraordinary proceeding. That gentleman did not recommend any course of action upon it, but said that he did not think it right that the matter should escape the notice of the House, especially as it related to a question of considerable importance, and might be drawn into a dangerous precedent. The promoters of the bill felt the difficulty in which they were placed in attempting to set aside an Act of Parliament, and they came forward with the explanation that at the time the bill was deposited in the House of Commons negotiations with the company were on foot, and under those circumstances it was thought expedient to postpone the calling of the ratepayers together until they were able to report the result of the negotiations. A meeting of the ratepayers was held, but not till after the introduction of the bill, and he believed not till after it had passed the second reading in the other House. The terms of the Act of 1851 had been distinctly disregarded, and he asked whether it was to be tolerated that the promoters of a bill should be at liberty to set aside a previous Act of Parliament merely because they considered it expedient to do so. He had heard it suggested that the rejection of the bill might be attended with the danger of an insufficient water supply to the inhabitants of Birmingham; but he held in his hand a pledge from the chairman of the company that there should be no falling off in the supply, and he believed that at the present moment they were engaged in purchasing 100 acres of land for the purpose of improving the supply. He rested his opposition upon none of those questions which, according to parliamentary practice, were the proper subjects of consideration in committee, but upon two grounds which were exceptional and peculiar, and either of which was sufficient to justify their lordships in refusing to read the bill a second time.

Lord ABERDARE hoped their lordships would negative the amendment because he did not consider it strictly fair that neither of the objections, which were considered fatal to the bill, should have been taken in the House of Commons. They were perfectly well known, for they were discussed before committee. The Chairman of Committees brought them specifically before the House of Commons, and yet no member of that House rose to move the rejection of the bill. The committee alone ought to dispose their lordships not to take the very unusual and exceptional course proposed by his noble friend. Birmingham enjoyed almost an extraordinary advantage in a sanitary point of view from its natural position, and it was the only large town in England that had escaped all the visitations of cholera. When cholera was raging all round, Birmingham escaped, and that had always been attributed to the exceptionally healthy character of its position. It had, however, been observed of late years that there had been a great increase in the death-rate, especially from diarrhœa. This led to inquiry by the local authorities, who discovered that not only in some respects was the water supply not all they could wish, but that, according to one estimate, 70,000 people, and according to another, no less than one-third of the whole population of Birmingham, were under the present state of things supplying themselves with water for drinking purposes out of shallow wells in the town itself. The increase in the population of Birmingham had been very rapid; and not only had the area extended, but there had been a considerable addition to the density of the population. Of course the wells from which so large a portion of the population was supplied had become far less wholesome with this growth, and therefore the corporation decided to have the power of supplying the town with water, which they could not do without purchasing the property of the water company. They considered that it would be necessary to compel every householder to pay the water-rate, and supply themselves with pure water. He thought he had stated enough to show that the local committee were justified in coming to Parliament for their powers. As to the compulsory powers to obtain possession of the property of the water company, the Act of 1850 gave power to the corporation to acquire possession of the water-works. It was said that the power had expired, but that was not the opinion of the local authorities, and was certainly not the opinion of the two very able counsel, Mr. Venables and Serjeant Sargood, who conducted in 1870 a bill for this very water company. In that year the local authorities opposed the bill in order to obtain increased powers, and it was then urged by both the learned counsel for the company, "Why do you not avail yourselves of the powers you possess under the Act of 1851 and take possession of the water-works? Instead of opposing us, why do you not buy us?" They had the opportunity in 1851, when they had power to raise £250,000 for the purchase of the water-works, but since that time the water company had greatly extended their operations. They had spent some £600,000 more, and the consequence was that the sum originally fixed as the purchase-money was now wholly insufficient. That was the main reason why the local authorities now came to Parliament. The House was scarcely in a position to decide whether the compulsory power of purchase had been lost or not; but it was the opinion of the adviser of the water company, in 1870, that their powers had not been lost, and the House of Commons, when this bill was before them, considered that they still existed. These questions, however, were questions to be investigated before a committee, and not to be determined by a discussion in the House. As to be third point—namely, that the corporation had not kept faith with the ratepayers, that they were bound to give notice to the ratepayers before they made any application to Parliament for further expenditure—it was somewhat strange that this objection should come only from

the water company. Not a single petition had been presented by ratepayers on the subject, and not a single complaint had come from the borough. The greatest publicity had been given to the proceeding of the corporation. In November last they published three times over the announcement that they intended to apply to Parliament, and it led to considerable discussion in the newspapers. Public opinion was entirely in favour of the application. The corporation did not call a meeting of the ratepayers before the bill was deposited, but on the 26th of February, which was before the bill went to the select committee, they did call a meeting. The ratepayers then had an opportunity of judging far more completely than at any other time upon the merits of the proposal, and they unanimously supported the resolution sanctioning the application to Parliament for the purchase of the water-works. These matters were all fully considered by the commmittee of the House of Commons, who reported that, in their opinion, the promoters had taken the course of not calling the preliminary meeting with no intention of proceeding against the wishes of the ratepayers or evading the provision of the Act of 1851. The meeting was not called at an earlier date because negotiations were pending upon which, to a great extent, the issue to be submitted to the meeting depended. The Chairman of Committees of the House of Commons did no more than his duty in calling attention to the apparent disregard, not in substance or reality, but in form, of the Act of 1851; but Mr. Raikes at the same time expressed his full belief that the committee were justified in granting the indulgence they had. He quite admitted that there was much of novelty in the form of the bill. The corporation were enabled by the Act of 1851 to purchase the works, either by private agreement or by arbitration; whereas it was proposed by this bill to give a sum of £1,000,000. This was done in order to avoid the long discussion and expense of arbitration; but if the committee did not consider the proposal fair or justifiable—though he had not heard that the water company objected to the amount as insufficient—they could either increase the sum or determine that the amount should be settled by arbitration. He hoped he had succeeded in showing their lordships that there was no ground for taking the exceptional course recommended by his noble friend of rejecting the bill upon the second reading.

The Earl of SHREWSBURY supported the objections urged by Lord Hampton. He thought it extraordinary that without alleging any complaint against the water company the corporation should be seeking to deprive them of their position after they had expended a large sum for the benefit of the town, and were just becoming prosperous. He read the testimony of Mr. Goodman, that the water supplied by the water company was both good in quality and ample in quantity.

The Marquis of HERTFORD, living within a short distance of Birmingham, was able to state that the supply of water to the town was good, and at a cheap rate. He believed it would be to the interest of Birmingham if the bill were rejected.

Lord CATHCART said he had no connexion with the town or with the water company, but he hoped that the bill would be sent before a select committee, in order that it might be considered upon its merits. They were bound to regard the interests of the water-works company, but they were bound also to have regard to the teeming population of Birmingham, exposed to diseases from an inadequate supply of water.

Lord REDESDALE said there was only one point of importance as affecting the proposal for the rejection of the bill, and that was the existence of a provision of an Act of Parliament directly in opposition to the manner in which the bill had been promoted. That was a point which was unquestionably worthy of serious consideration, and there was no necessity for postponing the meeting pending negotiations as to the terms of transfer, because all that the meeting would have had before them was expediency of an application to Parliament for the purchase of the water-works by the corporation. There was no doubt whatever, therefore, that if the objection had been taken before the second reading in the House of Commons it would have been fatal to the bill, the object of the provision being to give the inhabitants some power of preventing unnecessary expenditure by the corporation. No objection whatever was taken by the ratepayers to this bill. If any application had been made by even a small body of them with respect to the omission, it would have been impossible for their lordships to give way in the matter; and if there was any giving way on the subject, it ought to be under a stringent sense that whatever was done would not be allowed to be drawn into a precedent.

Earl GRANVILLE hoped that after the speech of the noble lord, the Chairman of Committees, the House would agree to the second reading. He quite thought that what they had to decide was a doubtful point, but as the ratepayers did not complain, and the omission had been condoned unanimously by the ratepayers, by a committee of the other House, and by the other House as a body, he thought they might very well pass over the technical objection to the second reading of the bill. At the same time he quite agreed with the Chairman of Committees that it should be understood that if under such circumstances the bill was allowed to proceed, their decision in the matter must not be taken as a precedent.

The LORD CHANCELLOR said that the provision in the Act of 1851 was one which Parliament had introduced in improvement Acts promoted by municipal corporations as a check on their wasting the public funds in the promotion of bills, and also as a protection to the minority of the ratepayers. As regarded the merits of the proposed legislation, that was a question which their lordships were not in the habit of entertaining upon a second reading of a bill. He said that the more particularly because, in a document which had been circulated among their lordships, some complaint was made of the proposal to purchase the existing water-works as without precedent. In omitting the requirement of the Act, the corporation ran a great risk, because if, instead of assenting to the bill, the ratepayers had refused their assent to it, the members of the corporation would have had to put their hands into their own pockets and pay for the promotion of the bill. If the question had been brought before a court of law, that must have been the result; but it was quite a different matter when it was brought before Parliament. The omission appeared to have been made by inadvertence or misapprehension, and it appeared that there was no opposition to the application. If the substance of that which Parliament required as a safeguard was obtained, it was not for them to interfere with the progress of a bill otherwise desirable, merely on the score of non-compliance with that which was merely a matter of form. If he could find that any injury had been done in the direction that Parliament desired to guard against, he should say that Parliament ought rigidly to maintain the rule it had laid down; but everything had been done that Parliament required. It would be unwise to throw over this bill now, when the only result would be that what might be a great public benefit would be postponed, and the same bill would be introduced next year; for, if the ratepayers consented now to the application, they would take very good care to consent in proper time next session.

The bill was then read a second time, without a division.

TUESDAY, JUNE 15.

The Widnes Local Board Bill was reported, without amendment.

The Manchester Corporation Water and Improvement, and Birmingham Gas (No. 2) Bills were read a second time, and committed.

The Marlborough Gas Bill was read the third time, and passed.

The LORD CHANCELLOR acquainted the House that the further Standing Orders applicable to the Blackburn Water Bill have been complied with.

A petition against alteration in the Blackburn Water Bill was presented from the Corporation of Blackburn.

THURSDAY, JUNE 17.

The Chelsea Water, and Barrow-in-Furness Corporation Bills were reported, with amendments.

The Slough Water Bill was reported, without amendment.

The Weardale and Shildon Water, and Blackburn Water Bills were read a second time, and committed.

The Market Rasen Water Bill was read the third time, and passed.

The Birmingham (Corporation) Gas, Birmingham and Staffordshire Gas, Birmingham (Corporation) Water, and Birmingham Gas (No. 2) Bills were referred to a select committee, consisting of Lord Penrhyn (chairman), Duke of Grafton, Lord Castlemaine, Lord Raglan, and Lord Greville; to meet on Monday, June 21.

A petition against the Broadstairs Water (No. 1) Bill was presented from owners, &c., of property in the parish of St. Peter. This petition is also in favour of the Broadstairs Water (No. 2) Bill.

FRIDAY, JUNE 19.

A report was read from the select committee on the Broadstairs Water (No. 2) Bill, that it is not expedient to proceed further with the bill.

The Commons amendments to the Inverness Water and Gas Bill were agreed to.

HOUSE OF COMMONS.

MONDAY, JUNE 14, 1875.

The Lords amendments to the following bills were agreed to:—Bradford Water and Improvement, Millom Gas and Water, Pontefract Borough Extension, Portishead District Water, Truro Water.

The South Staffordshire Water Bill (Lords) was read the first time, and referred to the examiners.

BURGHS AND POPULOUS PLACES (SCOTLAND) GAS SUPPLY (No. 2) BILL.—A petition in favour of this bill was presented from Forres.

TUESDAY, JUNE 15.

The Lords amendments to the Bath Gas Bill were agreed to.

The Inverness Water and Gas Bill (Lords), as amended, was considered; to be read the third time.

BURGHS AND POPULOUS PLACES (SCOTLAND) GAS SUPPLY (No. 2) BILL.—Petitions against this bill were presented from Dunse, Liverpool, and from the following companies:—Great Yarmouth Gas, Bath Gaslight and Coke, Brentford Gas, and Peterborough Gas. The second reading was deferred till Wednesday, June 16.

WEDNESDAY, JUNE 16.

BURGHS AND POPULOUS PLACES (SCOTLAND) GAS SUPPLY (No. 2) BILL.—Petitions in favour of this bill were presented from Alloa and Edinburgh.

The bill was read a second time, without comment, and committed for Thursday, June 17.

A petition was presented by Sir Charles Dilke, from Chelsea, in favour of the extension of the City of London Gas Act to the whole of the metropolis.

METROPOLIS WATER SUPPLY AND FIRE PREVENTION BILL.—The second reading of this bill was deferred from June 17, till Friday, June 25.

THURSDAY, JUNE 17.

BURGHS AND POPULOUS PLACES (SCOTLAND) GAS SUPPLY (No. 2) BILL.—This bill passed through committee *pro formâ*, and was ordered to be reprinted with certain amendments. Re-committed for Monday, June 28.

FRIDAY, JUNE 18.

The Lords amendments to the Leicester Water and Rochdale Improvement Bills were agreed to.

The Inverness Water and Gas Bill (Lords) was read the third time, and passed.

Report presented, "That the Standing Orders not previously inquired into in respect of the South Staffordshire Water Bill (Lords) have been complied with.

A petition was presented by Mr. Watney, from Newington, Surrey, praying that the City of London Gas Act of 1868 may be extended to the whole of the metropolis.

THE SIGNAL LIGHT AT THE HOUSES OF PARLIAMENT.

Mr. SULLIVAN asked the First Commissioner of Works whether the gas signal light on the clock tower of the House had been in use for three sessions; and if it were a fact that the contractors had not yet been paid for it.

Lord H. LENNOX replied that it was a fact that the signal had been in use for three sessions, and it was also a fact that Messrs. Wigham had not yet been paid for that light. The delay—which he regretted—had arisen from unavoidable circumstances. He had reason, however, to hope that the difficulties were about to be removed, and that the payment would shortly be made.

HOUSE OF COMMONS COMMITTEES.

MONDAY, JUNE 7.

(*Before the Right Hon.* W. E. FORSTER, *Chairman*; *Mr.* S. B. BRISTOWE, *Mr.* J. G. TALBOT, *Mr.* T. BRASSEY, *and Mr.* H. BIRLEY.)

METROPOLIS GAS COMPANIES BILL.

(*Continued from page* 884.)

The CHAIRMAN said he wished to make a remark in reference to the question asked on Friday, as to whether the promoters intended to call the commissioners or any of the Government officers, as he understood that they did not, and as he did not hear that any of the opponents would call them, the committee had been thinking the matter over, and as there had been so much in the evidence with regard to the commissioners, they felt it would be necessary to call them for their own guidance, or at least one of them. The committee also thought there would be an advantage, as they were Government officers, in their not being called by either party, but by the committee.

Mr. Arthur Gunn, examined by Mr. CRIPPS.

I am the accountant of the Metropolitan Board of Works, and have for some time past given particular attention to the accounts and to the finances of the metropolitan gas companies. The population supplied by the Chartered Company is 572,907; the London, 218,723; the Imperial, 1,001,336; the Independent, 182,159; the Commercial, 329,316; the Ratcliff, 62,474; the Phœnix, 481,301; the South Metropolitan, 176,510; and the Surrey Consumers, 182,086. I have here tables showing the quantity of gas sold by each company during the last six years, and the maximum dividend to which the share capital is entitled. [The tables were handed in.] There is also some further capital authorized, of which 2, 3, or 4 per cent. has been called up upon the shares, and some upon which nothing has been called up.

By the CHAIRMAN: The loan capital is not included in the total of £8,880,703. There are £26,000 of debentures belonging to the London Gas Company included, because in a paper presented to the House of Commons on June 4, 1874, there was a distinction drawn between stock and share capital, and loan capital existing at each date; and in the case of the London Gas Company, the debenture stock alluded to there was brought under the heading of stock and share capital.

Examination resumed: In 1873 the Chartered Company asked the commissioners for an increased price of 1s. 2d. per 1000 feet, and the commissioners sanctioned 7d. increase on the common and 10d. on the cannel gas, and this increase was to cover everything. That was for the purpose not only of making up their 10 per cent. dividend, but it also included what was necessary to make up the insurance-fund of £29,024, which was 1 per cent. upon the capital of the

company. In making their award, the commissioners did not specially allocate any sum as an insurance-fund. In their memorandum they stated that "the commissioners included the sum of 1 per cent. for an insurance-fund on a capital of £2,902,471," but they made no provision in the report that that should be carried to any particular fund, unless the dividend were paid first. The company applied again in 1874 for a revision, when their accounts of the previous year were before the commissioners.

Mr. CRIPPS: Can you tell me what they had done in 1873 with the amount given to them?

Serjeant SARGOOD objected to the question, and was replied to by Mr. CRIPPS, who maintained he was correct in his line of examination.

Mr. CRIPPS (to witness): Was the £29,024 in addition to what had been given the company to make up their dividend of 10 per cent.?

Mr. WEST objected to that question.

Mr. CRIPPS: At the end of the year in which these amounts were given, did the company carry any of the £29,024 to the insurance-fund to which it was to be applied?

Serjeant SARGOOD objected to the question, on the ground that there was no evidence that the fund existed.

The CHAIRMAN said it seemed to him that the objection would have come out very well in cross-examination. It would be very difficult for the learned counsel to agree exactly on the manner in which they should each put their questions.

Examination resumed: Nothing was carried to the insurance-fund. There was a balance, at the end of the year, of £209 on the revenue account, which was carried to 1874. The whole amount of increase obtained, through the intervention of the commissioners, was absorbed in paying the 10 per cent. dividend and the loan.

Examination continued by Mr. PHILBRICK: The paragraph in the commissioners report, stating that they "disallowed £5000 included in the company's estimate of expenditure for expenses," was a sum set by per annum, on amalgamation with the Great Central Company, to make up for Higgs's defalcations. In 1874 the company again applied for a revision of price, and asked for 5s. 2d.

Mr. PHILBRICK: In the estimate of income and expenditure for 1874, the estimated income from the sale of gas was £780,000, and in reality it turned out to be £928,000.

Witness: No; it is not quite so. The £780,000 is at 4s. 1d. per 1000, and the actual income of £928,000 includes the improved price which was given by the commissioners. Looking through the accounts of 1873, I observe that the company have paid a 10 per cent. dividend, and that they have also charged to the net earnings account the sum of £5000, carried to the defalcation account. That £5000 having been disallowed by the commissioners, it seemed to me, at any rate, a little curious to pay out £5000 from the net earnings account, without carrying anything whatever to the insurance-fund of the same year.

Mr. PHILBRICK: Nothing was carried to the reserve-fund; they did not put this before the commissioners, but, in point of fact, when you look at the company's accounts, as audited by the Government auditor, you see they have, out of the earnings of the year, put £5000 to cover this defalcation account.

Serjeant SARGOOD: That £5000 is dealt with under the Act of Parliament. Our hands are tied, and the auditor has found that we have dealt with it properly. Surely this committee is not going to reaudit the accounts.

The CHAIRMAN: The commissioners disallowed the sum of £5000 included in the company's estimate of expenditure for defalcations. Is there any account in which that £5000 is included?

Witness: In 1874 the accounts of the company were laid before the commissioners, and No. 5 account is the net revenue earnings of the company. The fourth item on the debtor side is £2500, that being the half-yearly amount which had to be carried to the defalcation account.

The CHAIRMAN: And is that the half of the £5000 which is afterwards disallowed by the commissioners?

Witness: It was previously disallowed by the commissioners, and this shows the disadvantage under which we labour. The commissioners disallow a certain sum of £5000, but they have no power afterwards, if the company carry it to defalcation account, to say that the company have acted in contravention of what the commissioners did.

Examination resumed: In 1874 the price asked for at the revision was 5s. 2d.; the price awarded was 5s. A sum of £31,500, which was 1 per cent. on the capital of the company, was again included in the increase of price; that amount to be carried to the insurance-fund, to which fund nothing had ever been carried before from the resources of the Chartered Company. There was a sum in it of some £30,000, which was carried from the Equitable reserve-fund when the amalgamation took place between that company and the Chartered; and, owing to the revision clauses, the price of gas in a very dear year was increased again to include the amount that should be carried to the insurance-fund, when, during prosperous years, nothing whatever had been carried to that fund. The proceeds of the year 1874 were better than the company anticipated by some £75,000. The company had estimated the increase of price awarded as only yielding them a surplus of something like £4000, and in reality it yielded a surplus of £79,000, or nearly £80,000. The company had estimated the price of coal at a larger amount than it actually worked out at, and the commissioners cut down the estimate for coal by a certain sum—probably about £25,000, but they do not state exactly what they reduce the cost by. The result of the year's working, as compared with what the commissioners said they were bound to allow, was larger than the actual estimate by £43,000. The company gave no notice of any application for an increase during the present year, the result being that the price went back to 3s. 9d. The company estimated the increase in the sale of gas during the year 1874 at between 1½ and 2 per cent.; the commissioners allowed 2½ per cent.; the estimate on the part of the board was 5 per cent.; and the result was more than 5 per cent. increase. The price of gas in excess of what was required to pay the dividend alone was 4½d. per 1000; but if an insurance-fund of £31,000 had also to be filled up, the price in excess would be 2¾d. Therefore, had the company been able to foresee the result from the beginning, and had they been able accurately to predict the working, 2¾d. more was granted than was absolutely needed.

The CHAIRMAN: Am I right in supposing that the estimate was, as nearly as possible, a correct one in 1873, but that it was an over-estimate in 1874?

Witness: In 1873 there was £29,000 provided by the commissioners for the insurance-fund, yet after the dividend was paid there was not £29,000.

By Mr. BRASSEY: When the price in any one year is in excess of the sum required to pay 10 per cent., the consumer might derive the benefit of that in the following year; the price might not be increased.

Mr. PHILBRICK: It goes to the credit of the divisible profits of the next year.

Serjeant SARGOOD: And now, therefore, we charge 3s. 9d.

Witness: And the fact of £30,000 having been put on each year in price gives the company an absolute guarantee, without any due care and management, to earn a dividend to that extent.

By Mr. BRASSEY: In an ordinary year a gas company might—the price being 3s. 9d.—earn enough to pay 10 per cent. dividend. They would provide nothing for the insurance-fund, because they are not bound to carry anything to that fund, unless it is earned over and above 10 per cent. But in a full year, when they are before the Revising Commissioners, they positively include the 1 per cent. for the insurance-fund, so as to raise the price of gas in that dear year by an amount which shall cover the estimated contribution to the insurance-fund.

The CHAIRMAN: If there had been no legal power given to go to certain gentlemen to revise the prices, the company would have thought themselves very well off if they, in a dear year, got that 10 per cent. dividend, without saying a word about the reserve-fund; but inasmuch as there is a power of going to the commissioners, and those commissioners have to include that in their estimate, the company continue to get a price from the public which enables them in a dear year to add something to the reserve-fund?

Witness: Yes.

By Mr. BRASSEY: If the companies set apart a regular sum for depreciation every year, that would add to the price of the gas.

Serjeant SARGOOD: Depreciation, in the sense in which you have applied it, is only used by us as applicable to leasehold properties, and not to plant.

Mr. BRASSEY: They charge in each year what is actually due to repairs, and so forth?

Serjeant SARGOOD: Yes.

Examination resumed: The Imperial applied in 1874 for 4s. 11d., and they obtained 4s. 8d. In the case of that company, the question of the contribution to the reserve-fund was even of greater importance than that of the Chartered, as the reserve-fund of the Imperial is a fixed amount of £81,250. If the company cannot make up its 10 per cent. in the year, they may draw upon that reserve-fund so long as there is anything there; and when they come before the Revision Commissioners, not only is the price of gas raised, so as to cover the cost of coal and all the outgoings of the year, and the maximum dividend, but it is also raised to fill up the reserve-fund to the full amount of £81,250. In the three prior years, 1871, 1872, and 1873, this reserve-fund had been drawn upon to make up the dividend; and then, in the year 1874, there was a sum of £53,302 charged on the consumers to make up what had been taken out of that fund during the three prior years. The price which the commissioners allowed in 1874 to the Imperial did not work out so much in favour of the company as the price they had allowed to the Chartered. The surplus which they had at the end of the year, instead of being £48,000, was only £20,782. Looking at these cases in 1874, both of the Imperial and the Chartered, it seems to me that there is no room left for any sort of wisdom, which is necessarily part of good management in any commercial undertaking, because the dividend is made sure to the extent of the amount carried to the reserve-fund. The capital of the Chartered Company, and of the companies amalgamated with it, has increased, per ton of coal carbonized, from £7 6s. 10d. in 1869, to £8 8s. 1d. in 1874, and for 1000 feet of gas sold from 7s. 4¾d. in 1869 to 19s. in 1874. Some part of this increase is owing to the policy of taking gas-works out of town; but, what the gas consumers wish to see is a stimulus given, as there is in ordinary commercial undertakings, to keep down the issue of capital; and from the present state of things and the present machinery, there is, no doubt, a positive encouragement given to the creation of new capital. If you overweight your concern as a private trader you suffer from it, and your profits are less; but supposing for a moment, which I do not allege, that the gas company were overweighted with capital, they would lose nothing, because they would come to the commissioners and say, "We ask that the 10 per cent. dividend may be made good on all this capital, besides allowing us for the cost of the manufacture of gas during the year," and, as at present constituted, the commissioners would be bound to give them a sum which would ensure a dividend upon that capital. The Imperial has increased, per ton of coal carbonized from £6 6s. to £7 12s. in 1874, and per 1000 feet from 14s. 6d. to 17s. 10d. So far as figures go I have had to criticize, on information furnished by the companies, their trading account; and with the machinery at command it is exceedingly inconvenient. The wear and tear of the Chartered Company in 1869, under the head of "Manufacture," was £35,893; in 1870 it was £35,256; in 1871, £43,800; in 1872, £51,200; in 1873, £69,800; in 1874 it was estimated at £75,000, and worked out at £85,000. Then again the wear and tear, under the head of "Distribution," in 1869 was £15,400; in 1873 it was £25,000; it was estimated for 1874 at £20,000; and they have actually expended £28,000. The normal increase in the consumption of gas is about 6 to 8 per cent. in some companies, but when one criticizes those figures it is altogether founded upon the statements that the gas companies give us. In the case of the Chartered Company last year the figures, as they appeared in their accounts, seemed to show a certain increase in the consumption of gas in 1873 over 1872; and then coming to 1874, and reasoning upon 1873, there was other information which the Chartered Company had, which we were not in possession of, and which upset, to some extent, our criticism. There again it is impossible for a body outside the gas company to see clearly what disturbing causes have been at work affecting the consumption of gas one year as against another year. I have seen in some of the Chartered Company's reports that they allude to the burning of some large place, or several large places, in the year. And that kind of information we outside the gas company, criticizing on behalf of the public, cannot have, so that on that very important item it is difficult to help the commissioners. In 1872 the strike of the stokers occurred, which of course affected the expenditure and also diminished the consumption of gas. The company, I believe, used their influence in getting public bodies to limit their consumption, to some extent, during the strike, and there was a loss also in the gas manufactured that year. When we came before the commissioners, no amount had been included by the gas company for the increase in the consumption of gas for 1873 over 1872 under that head; but yet it struck the Metropolitan Board that the consumption would be more because of that strike, and after the commissioners had had their attention drawn to it, they inquired into the matter, and Mr. Parkes, the official auditor, put the loss, directly and indirectly together, at as much as £35,000, which, of course, would not occur again in the year 1873. Then there was one other item in the same year the closing of the station at Horseferry Road which the company stated would not be required during the greater part of the year, and we deducted £6700 from their estimate of the deficiency in 1873, because that station would be closed. Then the gas company combated that very strongly before the commissioners, and it was only by the greatest pertinacity that the £6700 was allowed to stand. When the board are exercising their powers of purchase, they have a great deal to do with scrutinizing the accounts of traders in cases where compensation is claimed; but in the case of a gas company we have no access to their original documents; we simply have the accounts furnished to us. As to capital, there was a very important fact which came out in the case of the Imperial Company, who had a large unexpended balance at the end of the year 1873, of £307,000, and that arose from the fact that late in the year—on the 22nd of December—their first call had been made upon the new issue of shares, which brought a sum of £120,635, and although that sum was intact in the balance at the end of the year, yet the legal wording in the Act of Parliament, and the scheme on which the Revising Commissioners acted, obliged them to allow dividends on that capital. Had we had access to the books of the company, of course we could at once have seen whether it was positively necessary for the company to have raised that capital to the detriment of the consumer in the month of December instead of in the early part of 1874, as had been anticipated. It seems to me exceedingly clear that where a certain section of the public have to bear the cost of capital, that section of the public should be protected in the creation of capital. The Government is every year limiting more tightly the latitude which is given to public bodies in the creation of capital and in the raising of loans; and with reference to the Metropolitan Board, the strictest investigation is made before capital is allowed to be raised. No capital can be raised now by the Metropolitan Board except with the sanction of the Treasury, because the cost of this capital falls upon the ratepayers; and in the case of gas companies there is no tribunal coming between the consumers,

who have to pay the whole of the dividend on capital, and the company, which is specially interested in the creation of fresh capital. An instance of that is given in a recent meeting of the Chartered Company which was held in January last where they proposed at once to raise £500,000 of capital. There was no tribunal instituted to which the company could go and say, "We can show you that we want a quarter of a million next year, and we want to issue it." They account for it very properly, no doubt, that they wanted £120,000 for retort-houses, £25,000 for gasholders, and the whole of the detail is given; but it seems to me only proper that, inasmuch as the consumer has to make good the whole of this dividend, and is the party most interested in that transaction, there should be some sort of power at any rate to investigate the reasons for the issue of fresh capital. The actual effect of the companies being authorized to raise capital is that they are raising it at a premium of 10·7 per cent. The premium goes, of course, to the benefit of the individual who has the least interest in keeping down the capital, and who benefits by the issue of capital to the greatest extent. It seems to be a matter of course his getting the amount, so that he does not study whether the capital can be issued at a cheaper rate or not. As showing the avidity of the shareholders to take the premium, and to accept the very best terms they can, a shareholder said he was surprised that the new £500,000 stock was to be issued at 5 per cent. for a certain number of years. But the governor of the company said, "We have some little modesty, and some little consideration for the public, and we do not wish to do that which I think would create a just ground of complaint—viz., to raise capital at 10 per cent. when we can raise it at 5, because you will recollect that, in expending this capital, it will be some time before the works are completed and remunerative." The capital that the Chartered Company have issued during the last few years was 5 per cent. preference capital, convertible into ordinary 10 per cent. stock, and the price is about £170 or £180.

By Mr. BRASSEY: In practice it was new stock issued privately to existing shareholders, according to Act of Parliament.

Serjeant SARGOOD: The consequence is that they do not get 10 per cent., and therefore pay more for their stock.

By Mr. BRISTOWE: The stock that is not allotted would probably be issued at £103 if sold in the market, but that would be inappreciable.

By the CHAIRMAN: The bill of the Chartered Company, proposing the 5 per cent. for five years, was thrown out on Standing Orders.

Examination resumed: The Commercial Gas Company charged 4s. only in 1874, and took 2¾d. per 1000 feet sold from the reserve-fund to make up their dividend, so that 4s. 2¾d. was all that they required to make good their dividend. The Ratcliff Company at 3s. 9d., and the Surrey Consumers, charging 4s. 6d., earned more than enough. The Phœnix, charging 4s. 6d. and 4s. 2d., required only about one-third of a penny to make good their two dividends; and, of the two companies that came before the Revision Commissioners, the Imperial required 4s. 6¾d., and the Chartered 4s. 7½d., thus showing that these two great companies charged the consumers a price absolutely more than any other company supplying London. I have here a table showing the illuminating power and price of gas supplied by the several companies for five years ending 1874. [Handed in.] The greatest price was that of the Chartered, 5s.; but they might have done with 4s. 7¾d. It appears to me strange that, with the net price of 4s. 6¾d., which the Imperial required, and 4s. 7½d., which the Chartered required, after eliminating the savings on either side, the net sum required for each is in excess of the price charged by any other company. I have also made out a table, showing the loan capital and the share capital of each company, up to the end of last year. [The table was handed in.]

Cross-examined by Mr. RICHARDS: The Imperial Company have been for some time, and are now, constructing new works. Gas companies differ from railway companies in this respect—that they have no option whether they shall or shall not extend their works. They must supply the public with gas, under their Acts of Parliament. They are also compelled to supply every local authority which calls upon them to light the streets, provided the local authority puts up a gas-lamp at every 75 yards; and, whenever they have a main down any street, any consumer living within 50 yards can insist on being supplied with gas. It thus follows that a gas company must go on making works sufficient to meet the demand. One result of going a long distance out of town is certainly largely to increase the capital expended for leading mains; but, allowing for that to the very fullest extent, and giving the fullest praise to the companies, still every person who looks into the matter must see that there is every possible encouragement to the raising of capital before it is positively wanted, and indeed to raise more capital than is positively needed.

Mr. RICHARDS: You have spoken of the case of the Imperial, and of their having money paid up on the 22nd of December, so that there was, on the 31st of December, 1873, a large balance at their bankers. Was it not proved that that money was expressly paid up in order that they might meet the contracts which had been already made with the builders and contractors at the Bromley works?

Witness: That I do not know. If we had had access to the books of the company, we should have seen it; and that shows the disadvantages under which we are in criticizing your statement. We have no wish whatever to criticize unduly.

Mr. RICHARDS: I understand that what you wish was that, instead of being called up on the 22nd of December, it should have been called up on the 2nd of January, so that no dividend could have been paid upon it at all?

Witness: I have not expressed any wish in the matter. I have simply stated the fact to the committee.

Mr. RICHARDS: If it had been called up on the 2nd of January, 1874, and paid into the bankers, then I understand you to say that no dividend could have been allowed upon it. Do you think that that would have been fair to the shareholders?

Witness: I cannot give an opinion. The machinery is altogether in an odd and abnormal condition; it seems incapable of working. Of course, it is unfair if the capital is raised, and the shareholder expects that he will get a dividend, and there is no dividend for him; but it certainly is not unfair to a person who takes up scrip in a loan, if the terms are mentioned to him beforehand.

Mr. RICHARDS: I understood you to say that the consumer, in the issue of this capital, is the person most interested. Is the shareholder not to be considered at all?

Witness: The shareholder is considered fully, as it seems to me. He is almost spoiled, if I may use such an expression.

The CHAIRMAN: If the capital had not been raised till the 2nd of January, would any dividend have been obtained until the end of 1874?

Witness: Yes; a dividend would have been obtained equally. The commissioners ruled, at their first inquiry for the Chartered Company, that they could only allow a dividend upon capital actually paid up on the previous 31st of December; but whether it was fair or not, of course, I cannot judge. At the next revision—that of the Imperial—the company had raised their capital, which they had anticipated would be required in January, in December, so as to bring it within the ruling of the commissioners, by which a dividend would be allowed upon it in 1874. But it must not be supposed that, when the commissioners shut out the capital from dividend which was raised after the 31st of December, that that capital did not bear dividend. It would bear dividend, whatever terms might be made by the company itself; and it would be paid on the 30th of June and in December.

The CHAIRMAN: What did any shareholder gain and what did the public lose by the change of date from January to December?

Mr. RICHARDS: Ten days interest was what they lost.

Witness: This was the loss. The Revising Commissioners would have shut out the capital from the estimate of the dividend required for the year 1874 if it had been raised in January. Say for the moment that £1000 was required for the dividend, the estimate of the increase of price necessary for the year 1874 would have been less by that £1000; therefore, instead of the price being raised to 4s. 8d., it should be 4s. 7¾d.

By Mr. BRASSEY: It is a very difficult thing to suppose that the dividend could have fallen short of 10 per cent., because there was an additional £48,000 which the company had granted them to supplement their dividend if 10 per cent. was not earned; and, of course, what they earned over 10 per cent. went to the reserve-fund, so that one could hardly suppose that the dividend would run short.

By the CHAIRMAN: The total paid-up capital of the Imperial Company is £2,729,955, as near as may be, of which £1,560,000 is at 10 per cent., and the remainder at 7 per cent. The average is about £8 12s. per cent.

Cross-examination resumed: Under the Act of 1868 of the Chartered Gas Company, and also under the Act of 1869, applying to the Imperial and South Metropolitan, a public auditor is appointed, over whom the Metropolitan Board of Works have no control. He is appointed by the Board of Trade, and is an independent person between both parties. He has the largest powers of inquiring into the expenditure of the company. I have no reason to doubt that Mr. Parkes did go most thoroughly into the whole question, and I quite admit that a more competent man it would be difficult to find. I cannot conceive of any clauses giving more complete powers to the public auditor than the clauses under which Mr. Parkes is appointed.

Mr. RICHARDS: Under these circumstances, is there anything connected with the company in its most minute working that Mr. Parkes, the auditor, has not the power of inquiring into?

Witness: Take the very case which I am speaking of; what has the auditor to do with the estimate of the year for which the Revision Commissioners have to fix a price? As regards the accounts, I have not at all impugned the audit, or questioned it in the least. The commissioners could not entertain the question when it was raised. I am not aware that the commissioners complained of being unable properly to conduct the inquiry. With regard to the question of wear and tear, I do not think that the Metropolitan Board of Works should have constant access to the books of the companies, and overhaul them. What I say is, that if the Revision Commissioners are to include a given sum, say for wear and tear, it is very proper that those persons who have to pay the cost should be heard; and Parliament having given the Metropolitan Board and the City, in the case of the Chartered Company, the power of appearing before the commissioners, shows that the public are to be protected.

Mr. RICHARDS: The commissioners did inquire into and strike out a great many items. In what possible way could they have had greater powers of revision than those which, in point of fact, they exercised?

Witness: I have not said that the commissioners could, although I think they could, if we had had the power of questioning the figures that were given to us. Take only this one item of £120,000, raised in December. It is not for us to say that it was absolutely necessary to raise it in December and not in January. I brought before the commission the fact of that account being intact in the balance, and they deducted it from the estimate.

Mr. RICHARDS: With reference to the recent revision, was the result such that the price given by the commissioners did give the Imperial a large surplus upon June 30?

Witness: They had less than was estimated. In order to make up their dividend on June 30, 1874, they had to take as much as £26,000 from their reserve-fund. But then a very important consideration was left out—namely, that all the coal was contracted for at very high prices, and the orders from the consumers in the first half of the year, and the coal that had not been contracted for at a dear price came into the second half year; therefore, of course, it was to be anticipated that the working of the first half year was more expensive than the working of the second.

Mr. RICHARDS: Assuming that the commissioners were to give such price as, with care and management, would make up the maximum dividend alone, they did not, in fact, give a sum which, at the end of the first half year, met the sum required for the dividend?

Witness: Yes, if we are to call it care and management. The result that year was not so good as was expected, the amount left at the end of the year being only £20,000, instead of £48,000; but I am not prepared to say that, with better management, the surplus at the end of the year might not have been larger. I am not insinuating in the least that there was a want of due care, or a want of management either, in the raising of capital, or in the actual working of the companies. The Revision Commissioners cannot sit again to say that the company had not shown due care and management during the year, and, therefore, they shall be mulct in a penalty for it. It is altogether a prospective action, and then there is no effect given to anything like a penalty clause, which there should be. I do not propose a revision of the capital as it stands at present; but what I suggest as a very desirable thing is, that in each fresh issue of capital it shall be shown, on behalf of the consumer, that that issue is absolutely necessary; just in the same way as now a public board has to apply to some superior authority to enable them to raise a loan. You may create a new tribunal; it may be the Revision Commissioners, if you please, if they are still left in existence, or the Board of Trade. I do not say that every issue of capital is to be the subject of a fresh legal inquiry and a fresh arbitration; but admitting for the moment that the board are prepared to go into the question of new capital, they have no opportunity of making their opinion heard. The machinery that this bill will create will, we think, work effectually. What I have been trying to show is that the company is positively encouraged in the creation of capital before it is wanted, and it is desirable that the consumers should be protected in that direction. The bill as at present drawn would, to some extent, I think, have the result of keeping the capital within bounds, because the directors before they raise capital will say, "If we charge this company with capital the shareholders will have to suffer for it, because the dividends will be less if we have to raise the price of gas in order to make a dividend good." Our remedy is to give 3s. 9d. per 1000 feet as a fixed price with a descending scale, the companies to get their dividends if they can. We do not propose an ascending scale, but we propose what appears to us to be equally fair—a reserve-fund of 5 per cent. upon the capital, which would make good the dividends. I know nothing about the conduct of a gas company, and therefore it would be hardly fair to ask me whether a company should or should not contract for their coals, or whether they should or should not buy them from hand to mouth. I know that one peculiarity of a gas company is that its capacity, power, and so on, must be measured by mid-winter.

Mr. RICHARDS: Will you turn to the balance-sheet of the Imperial Company for Dec. 31, 1873. I see there "Cash at bankers and on deposit, £67,784 5s.," but you told me just now that they carried over a balance of £307,000?

Witness: If you turn to the capital account of the Imperial Company, you will find the figure I quoted. There is a capital account there which shows that the balance of capital unexpended is £307,000, showing the capital was not required at the time.

Mr. RICHARDS: Then you have included the floating balance?

Witness: Yes, certainly. The balance at the bankers has no relation whatever to it, because that balance might consist of the dividend that was paid and the amount from revenue account; but when we see that in the capital account there is £307,000 unexpended of the capital, and £122,000 was raised a few days beforehand, the £122,000 is in that £307,000. It is from the very nature of things impossible to avoid, where works are being constructed, that the ex-

penditure is not in the first instance absolutely remunerative; but admitting all that fully, that state of things shows there are encouragements to the creation of capital. To construct an enormously large new work, that shall be sufficient for the consumption of gas, and increase the gas-rental for a large number of years, would clearly be more remunerative than constructing houses as they are required to meet the exigencies. I do not suggest that the Imperial have been expending capital upon works, looking forward to an undue period. In constructing works for gas it is absolutely necessary to construct them well and solidly. I am aware that one of the items of expenditure by the Imperial was the necessity for connecting the works at Bromley, which lay on the other side of the river Lea, with the metropolis by a bridge, and, of course, the leading mains had to be carried over that bridge.

Cross-examined by Serjeant SARGOOD: I know that the duty of the commission was to fix the price in order to give 10 per cent., and not more, for the dividends, and to provide an insurance-fund. In order that those things might be done by price, it would be necessary to know, of course, something like the number of million cubic feet of gas that was going to be sold, that being the only thing that price could attach itself to. Therefore, of necessity, the number of million feet to be sold was an estimate; but it would be the bottom stone of the whole inquiry. In order to get at that, the expense of the company in the last year was exhibited, and nobody doubted the accuracy of the figures. The problem to be solved was what per centage should be added for the increase of the current year, having regard to any extraneous circumstances, as well as to the natural rate of increase which experience had shown; and by these means the commissioners arrived at a figure. I have no fault to find with the patience with which the commissioners listened to the company's figures. They sat, I think, most patiently, and listened to everything that was brought before them; and, of course, their decision is not for me to question. The quantity having been ascertained, the next thing was to find out what price would produce a given sum. The amount of interest to be paid on the loan capital was a thing ascertainable with accuracy. The next thing to be found out was the real capital bearing 10 per cent. interest, or the real amount of the company's dividend. The amount of the capital, subject to a certain per centage of dividend, was a thing beyond dispute; the only issue being whether the companies ought to have raised so much capital, and thereby taxed the consumers so severely; and a very important issue that is. The question of the insurance-fund was also a thing of very easy calculation. The only remaining element was the sum to be provided that might either be found in an existing profit to some extent, or would have to be provided by an additional price per 1000 if the working of the company was a loss. The first thing was to submit to the commissioners what amount of profit the company anticipated they should make during the year. On that subject we were heard, and our estimate differed very much from that of the company. In ascertaining the profit, of course a very material question would be the amount of the proposed income, and the expense of carrying on the establishment. The difference would be the profit which would represent so much towards the normal price of the gas, the remainder being the supplement that the commissioners would put on. The two points upon which we were successful before the commissioners were the stokers strike, and the shutting up of the Horseferry Road station.

Serjeant SARGOOD: The stokers strike was not income, that was expenditure.

Witness: The stokers strike diminished the sale of gas, and you, in your statement which you put in before the commissioners in 1873, did not allow for any increase in 1873 over 1872. The answers to the questions that you gave to us would unquestionably give no information of that kind, and it was by a sort of accident that we discovered it. We urged it before the commissioners, and they allowed £15,000 as the probable increase of the consumption of gas of 1873 over that of 1872 on the income side.

Serjeant SARGOOD: That is a very funny way of answering my question. I show you where you failed, you are showing me where you succeeded. I want to know one point on which you failed, either in justice, or to get information, or ability to use it when you got it.

Witness: You know ignorance is not always bliss, and we say there might have been a great many points in which if we had been better informed we might have been more successful before the commissioners. This system of formal interrogatories—getting out this information in a sort of hap-hazard way—needs the closest attention in order to bring out the facts. We say it is not a convenient mode of controlling the increase of price on the part of the gas companies, and so the bill suggests another sort of control. Take the case of the closing of the Horseferry Road station, involving a sum of £6750; that appeared in so very vague a way upon the answer to an interrogatory, that when we had this matter before the commissioners it did not seem at all clear from the expenditure that that item could be detected. After it was found out, it was clear; but we might have failed in that case.

Serjeant SARGOOD: Was it not found out by your putting our officers into the chair to give the commissioners an explanation, and subjecting them to the cross-examination of your people, and then following it up by argument to the commissioners?

Witness: No; it was not so.

Serjeant SARGOOD: What value is there to the commission, in your position as witness, giving them your idea, not founded on our figures, when you abstained from asking any gentleman who could have explained our figures anything on the subject?

Witness: I think you will see that your Mr. Hartridge was called and examined on that very subject.

Serjeant SARGOOD: If Mr. Hartridge was called and examined on that very subject, where is your grievance?

Witness: I say there is no grievance upon that point, because we got a disallowance of £6750; but there may have been parallel cases, which we have not found out.

Serjeant SARGOOD: But anything may be. Are you really and seriously coming here to ask for a new Act of Parliament simply because it is possible that there may have been something that you have not yet discovered?

Witness: That is a new aspect of the case altogether; clearly the condition of things is not satisfactory.

Serjeant SARGOOD: A whole is made up of its respective parts. I am trying with you, as I did with Mr. Livesey, with whom I quite failed, to get you to give me or the committee any suggested reason for this alteration, founded on any fact which you can point out, that injustice has been done you?

Witness: Of course, we do not suppose for a moment that we have had positive injustice done by withholding information. The very fullest information has been given, and no doubt the Revision Commission, if they were here to-day, would say that they had been given every information. With reference to the stokers strike, there was nothing whatever in your replies, neither could we elicit it by any question, which could indicate to the commissioners that the quantity of gas would be greater in 1873 than in the year 1872, because of that strike. It came out while the inquiry was going on. There were also several things that were not admitted by your officers. I do not say that the inquiry has not been quite full enough, but I say accounts were not presented in such a way as to enable us to criticize the statements put before the commission by the companies.

Serjeant SARGOOD: It is useless to keep on all day long discussing points that were discussed before the commission, both sides having been heard, and the commissioners having given their decision. The question is whether, that system having failed, you should abolish all this machinery, which, at a very great cost, you put in motion to protect yourselves?

Witness: To go at once to the question of the contingent and reserve fund, that in itself, apart altogether from any inquiry as to the annual expenditure, or the amount which should should be paid from dividend, seems to me a warrant for changing the machinery.

Serjeant SARGOOD: Can you give me anything, in the case of the investigation into our income, in which you have suffered injustice?

Witness: If my recollection serves me right, there was a good deal said about coke at that inquiry, which, of course, comes on the income side.

Serjeant SARGOOD: That is exactly an instance. Hours and hours were spent in investigating the price of coke—what we were likely to get for it, what we ought to get for it, and what probably we did get for it. We may not have agreed in either hypothesis, but the subject was thrashed out thoroughly.

Witness: Yes, but we say that you will get a better price for your coke if you know that your dividend depends upon the price you get for it. That is a perfectly sound commercial argument, and there is no getting away from it.

Serjeant SARGOOD: That is argument, not fact. Can you mention any fact, in reference to the estimate of our income, in which you say that there was a failure of justice towards the consumer for the want of power to inquire?

Witness: When one does not know what the facts are, one cannot say. If I knew further the working of the company, I should be able to say whether they could have, in 1872 or 1873, practically shut up another station than Horseferry Road.

Serjeant SARGOOD: What more could any human being have done in the shape of inquiry? Could anybody do any more than make an approximate estimate of the probable saving by shutting up that station?

Witness: Clearly, as regards that one point, no doubt the information was given to us; but we were not in a position to say that any other station would be closed.

Serjeant SARGOOD: On the whole, how could we, short of putting you in the position of being a director of the company yourself, have given you any fuller information?

Witness: Not as regards the Revision Commissioners, probably; but we say it is hopeless to endeavour to continue the present state of things.

Serjeant SARGOOD: With regard to expenditure, have you discovered anything since the revision, which would enable you to tell the committee that the revision did you injustice, because there were some facts which you were unable to discover through its means?

Witness: I think it is not exactly a thing chargeable against the company, but we say that their expenditure on wear and tear is very irregular.

Serjeant SARGOOD: Did not you know that at the time of the revision?

Witness: Certainly we did.

Serjeant SARGOOD: Will you give me something that you did not know at the time of the revision, that you ought to have known, and the want of knowledge of which has done you an injustice?

Witness: The coal which you bought during the year 1874 was, no doubt, considerably less than you estimated for.

Serjeant SARGOOD: Could that fact have been known at the time of the revision?

Witness: That is just one of the things in which we are so at a loss that we could not get at the facts. The actual cost, certainly, could not have been known at the time of revision.

Serjeant SARGOOD: Will you point out any fact which you might have known at the time of the revision, and ought to have known, but which you did not know, and thereby have suffered?

Witness: Of course it is entirely a matter of detail. I will give you an instance. The balance of the cost of the strike in 1872—namely, £5024—ought to have been deducted from the dividend of the year 1872. That matter was brought before the attention of the Revision Commissioners, but they had no power to deduct it. The Corporation of the City of London went to the Board of Trade upon it, and £5024 has positively been deducted during this last year.

The CHAIRMAN: Can you give us a reason why you think there might have been something? Was there or was there not anything?

Witness: No; there is nothing which we have discovered since.

Serjeant SARGOOD: Did we not in our accounts charge for the prospective expenses of the year a part of the stokers strike expenses which were then outstanding and unpaid?

Witness: Certainly you did; but you did not charge sufficient. In your estimated quantity of gas to be made in 1873 you did not at all recognize the fact that the gas consumption would be more than in 1872. That shows a want of information on your part; and a something which was not clear upon your paper was elicited afterwards, and laid before the commissioners.

Serjeant SARGOOD: You want me to mention to you one or two particulars. I will take the £5000 of Higgs, in reference to which the commissioners said—and I want to invite your attention to these words—"We disallow the sum of £5000 included in the company's estimate of expenditure." There was no notion about the Revision Commissioners dictating to us whether the payment of that £5000 should be allowed or disallowed in our accounts. They only said, "We will not allow you to estimate your expenditure of 1873 at £5000 more than it should be, by including that figure." Do not you know perfectly well that they founded that upon the provision in the scheme for amalgamation, which showed that the £5000 was to be a charge upon that part of the profit that had been already allocated to dividend, and that when that point was mentioned, I, as their counsel, at once said, "I think that is perfectly right; I must consent to the £5000 being struck out on that point"?

Witness: I think you did.

Serjeant SARGOOD: In order to show whether the idea of our having paid that money was a breach of faith or not, did not the arbitrators award, alluding to this very question, say, "The company had also expended for defalcation £5000, and for the stokers strike £5024, which amounts have not been allowed for by us," because they had no power to allow or disallow?

Witness: Quite so.

Serjeant SARGOOD: Therefore that looks as if they were alive to that fact. They merely said, as against the consumers, they could not allow us those two items as part of the cost of producing gas for that year, and beyond that disallowance they did not go?

Witness: No.

Serjeant SARGOOD: You say there is great hardship upon the consumers in not getting any portion of the profit of 1873 put into the insurance-fund. Had you been a Revision Commissioner, will you tell me how you would have managed to get it into that fund?

Witness: No; of course that could not be under the Act as it is at present drawn. That is why the corporation and the board are coming for an alteration of the Act of Parliament. It must be apparent to any twelve Englishmen that your putting on this 1 per cent. upon the price of gas for the insurance-fund, which amounts to £30,000, is wrong, if the whole of it may go to make up dividends. Surely that cannot be a good state of things, because it is only in a dear year, when you come before the Revision Commissioners, that really that is included. In a moderate priced year—say, for instance, the present year—now that you have made the price of the gas 3s. 9d., I am sure in your estimates you have not included anything for the insurance-fund. When a company makes gas at 3s. 9d., and shows a profit, they will carry the balance to the reserve-fund.

Serjeant SARGOOD: No doubt they will; and if you had made gas at 3s. 9d. in 1874, with a large insurance-fund, you would have carried it then?

Witness: Yes, in 1874 you did; in 1873 you did not.

Serjeant SARGOOD: In 1874, if the company made such a profit as to pay

their 10 per cent. and leave a surplus, they would carry it to the insurance-fund.

Witness: Certainly, but with a very high price of gas; 5s. being the very highest price charged in the metropolis. I do not know the operations this year since Christmas.

Serjeant SARGOOD: Then it all comes to this, that in 1873 they made enough for their dividend, but they did not make anything beyond, that they could put into the insurance-fund, except that miserable £209; and in 1874 they made enough to fill up their insurance-fund and for a profit beyond?

Witness: I cannot say that I know officially, although I do theoretically. I am aware that the profit is carried to the credit of this year, which has a direct tendency to render it unnecessary for them to increase the price again.

Serjeant SARGOOD: Which of the two revisions do you find fault with, the revision that did not give them enough to put something into the reserve-fund, or the revision that did?

Witness: We find fault with both years, because in both years there was a sum of £30,000 put there which, to some extent, diminished the care in the management which otherwise might have been probably necessary.

TUESDAY, JUNE 8.

Mr. *Gunn* recalled, and further cross-examined by Serjeant SARGOOD.

I am aware that, by the Act of 1868, the insurance-fund depends for its existence upon the fact that there must be some surplus profit beyond that which is sufficient to pay 10 per cent; but I cannot believe that it was fully foreseen by Parliament that, although for a certain number of years prior to a cheap year nothing was carried to the insurance-fund, in that dear year £30,000 should be provided for the insurance-fund, and nothing whatever carried to it. I do not say that I would give precedence to the insurance-fund over the dividend in the event of revision, but I would give it such a modified claim as should ensure due care and management during the year, which is one of the vital principles of that Act of Parliament. We say that, with due care and management, without making any allowance for the insurance-fund, when the companies come before the Revision Commissioners, they ought to be able to state their case and get the price fixed; and putting in an insurance-fund, over and above the other estimate, simply helps them to get the 10 per cent. dividend without the necessity of due care and management. We are not here to make charges against the companies. We accept the state of things, and say, "Work the Act of Parliament as best you can, there are still these objections against it." The price at which gas was sold in 1874 shows a tendency towards the want of due care and management. And there is this fact, that the two companies that come up for revision required more per 1000 cubic feet of gas than any other company in London; that whereas the Ratcliff Company's 3s. 7d. would have been sufficient for them, 4s. 2¾d. for the Commercial, 4s. 4½d. for the Phœnix, and 4s. 6·54d. for the Surrey Consumers, the Chartered required 4s. 7½d., and the Imperial 4s. 6·62d. I think, with other things, that is a test which the public will at once lay hold of; but I do not say that I would ground the whole case upon that one small matter of detail.

Serjeant SARGOOD: Assuming that the year before last we were under your revised bill, and that we had not earned 10 per cent., and supposing that last year we had made 10 per cent., and got something to carry over to your 48A and 48B clauses, do you intend to pay our back dividend of the year before last out of it?

Witness: Oh, no, certainly not; back dividends are altogether contrary to mercantile principles, as understood in these days. The Act of 1868, which is the latest gas legislation, provides nothing for back dividends. The Chartered Gas Company, in the latter half of the year 1872, only paid at the rate of 9 per cent. per annum dividend. In the year 1873, when they came before the Revision Commissioners, there was nothing allowed for the back dividend, and this bill does not provide for it. The object of the "dividend deficiency-fund" is to make up any deficiency in dividends of the current year.

The CHAIRMAN: If you turn to 48A, you will see it says that this excess may accumulate at compound interest until the fund so formed amounts to a sum equal to 1-20th of the paid-up capital of such gas company, which sum shall form a fund to meet any deficiency which may at any time happen in the divisible profits of the company. Would not that mean that it was to be applied to make up back dividends?

Witness: Not back dividends; only dividends deficient at the time.

Serjeant SARGOOD: Assuming that this year I have had an unlucky year, and made only 7 per cent., I have no surplus, of course; but next year I am luckier, and make 12 per cent. Then I divide 10 per cent., and put in 2 per cent.; and you say that, if the next year I am unfortunate, I may go to that box?

Witness: Yes, and I think that is a sound principle.

Serjeant SARGOOD: Supposing next year it is my misfortune to make only 6 per cent. with the utmost care and management, and I go to my box and take out the 2 which you think is right, supplementing the 6 and turning it into 8, am I never to get beyond that, however industrious I am, and make up the full 10 per cent. for that year?

Witness: Certainly not, and you cannot do it now. If there is any provision of that kind it must encourage slackness of management.

Serjeant SARGOOD: Let me invert my experiment; assume that this year I make 12 per cent. and divide 10 per cent. and put by 2, do not you think the fact of that 2 remaining is an invitation to such laxity of management as would only produce 8 per cent., in order to absorb the 2 per cent., knowing that if they do not get it that year they will never get it afterwards?

Witness: There is this decided encouragement to good management: the company are making 12, and they say, "We can only divide 10 per cent., perhaps we shall want the 2 next year to make up a bad dividend; therefore we must strenuously exert ourselves, and make the 12 per cent. for that." That is the greatest incitement to good management. As to the sliding scale, we have fixed a normal price, which allows the companies to make 10 per cent. if they can. But if they want to put the price up, they must put the dividend down. We do not propose to put the price down to let the dividend go up, because 10 per cent. is the limit that is fairly given to all monopolies. The gas companies have a perfect monopoly in London; and we say that the dividend should not go beyond 10 per cent. because of that monopoly.

Serjeant SARGOOD: If 3s. 9d. was a fair and proper price to gain 10 per cent. in 1868, was it an equally fair one in 1873, when, by your own confession, the price of coal, and the price of labour, and the price of materials were very much higher?

Witness: Of course there must have been an advance upon 3s. 9d., and that might have been met by the reserve-fund. The Chartered have no reserve-fund; but they should put themselves in the possession of one.

Serjeant SARGOOD: Mr. Cardwell's legislation in 1868 conceded this, that you should fix a price, which, with due care and management, was calculated to give us 10 per cent.; and the Revision Commissioners were told that if they had occasion to arrange that price at a different figure, they were to do it in such a way as with due care and management should give us a dividend approximating, and not exceeding, 10 per cent. Do you seek to upset that principle?

Witness: No; but we seek to upset the other principle of the insurance-fund. The board are prepared to show that with due care and management 3s. 9d. is a fair price. We do not interfere with the principle when we say that the moment the price is put up you shall put your 10 per cent. down; because in a run of years there are many years in which coal is cheap, and it is only an exceptional state of things when coal is so dear that the 10 per cent. cannot be earned with the 3s. 9d. Then provision is made that in the ordinary average of moderate progressive years the reserve-fund shall go on accumulating, so that in a dear year you are sure of your 10 per cent. with the 3s. 9d. It might appear to be inconsistent in one way, but looking at it altogether, and taking the experience of gas management, we say that you are sure of your 10 per cent. under this bill. In 1868 you were not sure of your 10 per cent.; in 1872 the Chartered Company paid a dividend of only 9 per cent. per annum.

Serjeant SARGOOD: Assuming the theory is a right one, that no gas company, however honest and industrious, should ever earn more than 10 per cent., do not you think, before you meddle with the principle, that it would be fair to provide a minimum dividend which should be called interest on capital, before you talk of giving the consumers any interest in the profit, to which they have neither contributed in capital nor brains?

Witness: A mercantile firm, if they have made a bad year, cannot go to their customers and say, "We want to charge a higher price, in order to make up our interest on capital first, leaving profits out of the question;" that is what you do to the gas consumers. I do not think it fair that the companies should be guaranteed a minimum dividend in the shape of ordinary interest on their capital, before the consumers are allowed to share in the surplus profits, because there is no mercantile establishment that does it at all. If their business does not by its natural working bring them in 5 per cent. interest, the partners would not take the 5 per cent. interest, and charge the interest in a future year. I am quite aware that no company can raise capital except by permission of Parliament, and that they have to apply for an Act, and make out a case that they require the capital; but there ought to be some machinery by which they could be checked in raising money before it is wanted, and the 6th clause of this bill would do that. With this clause before them the company would not issue capital before it is absolutely needed. The question of the amount of capital or the amount of dividend in the aggregate is affected most materially, because if the rate of dividend is dependent upon the profit of the year, and the profit of the year is dependent upon the capital being only obtained at a moderate rate; this clause keeps the capital down. Supposing the price of gas is 3s. 9d. for 10 per cent. to be divided in that year, and the companies wanted another quarter of a million of capital raised, they would say, "If we raise that quarter of a million in this year, we to that extent endanger our dividing the 10 per cent.," and they would put it off till the next year. That is a thorough mercantile argument. My complaint is that by raising the capital they do get their dividend, and thereby get so much more out of the public than they ought to get, because they come before the Revision Commissioners and say, "We want it." Of course, the price of coal has only an effect upon the year in which that coal is consumed, but the raising of capital has an effect upon all time afterwards; and therefore this clause will most effectually, as we think, prevent the raising of capital before it is wanted. I suppose that all capital raised is intended to be used, and I think, as a commercial theory, that when these men raise capital, they ought to look to that capital earning its own dividend.

Serjeant SARGOOD: And if it earns its own dividend, the work it is doing could not be done without that capital?

Witness: There you go a step too far. Supposing that the building of a retort-house might be done for £10,000, if you make it cost £15,000 it is a positive gain to the proprietors, and that is the state of things now. Supposing the Revision Commissioners had thought they could have dealt with the subject of capital, then the testimony of engineers who went to Beckton would have been of some weight as to whether those works were built as economically as possible. The question was challenged in the Imperial case, and the Revision Commissioners were asked to go and exercise their own judgment upon the works of the Imperial Company, and they went, but it would have been very gratuitous if they expressed an adverse opinion against the company in favour of the public. They were simply judges as regards the price, and any element which was shut out from their consideration in fixing the price, they had nothing whatever to do with. Possibly they did form a judgment, but they did not express it. I am aware that the principle of Parliament has been to protect the public against lending their money to companies, by not allowing the companies to borrow more than would bear a certain proportion to their capital already raised. We do not propose to invert the order of things, and make them borrow first and raise their share capital afterwards; we leave it to work in its natural way. The Corporation and the Metropolitan Board together are as anxious as possible that the working of the thing should be natural. If they could borrow of strangers at 5 per cent., it would not be fair that they should raise it among themselves at 10 per cent. We say it is not right, with this monopoly, that a shareholder should have an opportunity of subscribing the capital with all this great premium attached to it, unless there is some corresponding advantage to the consumers. I think, unless there is some great risk or uncertainty, there is a very great favour shown to the gas companies, which an ordinary mercantile company does not possess. I am aware that when the price in the market, at which the share is issued, is more than £10, the holder of the share only gets a dividend on £10; and if he sells his share to the public, thereby making a gain, the public which gives £13 do not get 10 per cent. upon their purchase-money. The company issues its new capital to its existing shareholders because it is compelled to do so, by the provisions of the Act of Parliament. I accept the proposition that, the companies being forced to give the option to their own shareholders, it is not dependent on providence or improvidence, but upon the statutory obligation, when capital is raised, to distribute it in that particular form. There is no object whatever in pressing gas companies to raise their capital at an unremunerative rate. All we say on behalf of the consumers is, let us be fair on both sides. Here is £1,000,000, in five years it will be £1,800,000 in the market, and we do not think it fair that you should be able to have all the advantage, and the consumers should, through the revision machinery, be compelled to pay 10 per cent. upon it. Our bill meets this by saying that the gas company will henceforth have an interest in raising their capital, not only not before they want it, but in as moderate quantities as they want it. For instance, if at Beckton they could save £100,000, it would be to their interest under the bill to save that amount, whereas now it is their interest to expend more than is necessary by £100,000; and I think the commissioners should have power to disallow dividend upon so much of the capital. The shareholders certainly would have to bear the loss, because they are represented in the directorate, and if they are not satisfied that the directors are carrying out the affairs of the company properly, they have the power of removing those directors, and appointing others, and it is upon them the loss should fall. With reference to the million of capital under the Act of 1872, of which the company have still about one-half to raise, the bill does not propose to abrogate any power of the shareholders under the existing Act of Parliament. Their right will only be interfered with to this extent, that unless the directors manage the company properly, they will not be sure of their 10 per cent.

Re-examined by Mr. CRIPPS: The shareholders are represented for all purposes by the directors of the company, who appoint and superintend the officers and servants; and unless those directors exercise due care and management, the shareholders would have no right to the dividend, which depends upon that management. The companies have not, under any Act of Parliament, an absolute guarantee that they shall have a dividend irrespective of due care and management as traders. By the operation of the Act of Parliament, the consumers, and not the shareholders, are the parties who are really interested in

due care and management. And our object by this bill is to give the consumers, as far as possible, some check upon those directors, whom they do not appoint, and whom they cannot control otherwise. The first matter before the commission was as to the income from gas, and in order to ascertain what that income would be in the coming year, it was necessary to ascertain what it was in the past year. Then, again, that was entirely supplemented by the estimate, and it might be very different, from unforeseen causes, in the coming year. That was the case in the revision of 1873 particularly. Those figures had then to be investigated, and any facts that the company had not acquainted us with had to be got at as best we could, and it was a most inconvenient thing the information was not always accessible; not through any want of courtesy on the part of the company in not showing us what we asked for, but from the very nature of the case. With reference to gas sold in the past year, or to be sold in a future year, that also was complicated by the statement that the gas produced and the gas sold were not the same. A considerable portion of the gas produced was never sold, because it went in leakage. That was a matter to be inquired into upon evidence—how much leakage did occur, and how much ought to occur—two totally different things.

By the CHAIRMAN: I have read the paragraph in the letter from the Board of Trade, proposing that the price and dividend shall vary inversely in certain fixed proportions, without limit, and I heard Mr. Livesey's evidence, but I do not think it an advisable suggestion, because it would be going beyond the 10 per cent., which is the rate of dividend considered by the Metropolitan Board sufficient for so large a monopoly as this. I have no further opinion to give in explanation of that.

Mr. *Thomas William Keates*, examined by Mr. O'HARA.

I am consulting chemist to the Metropolitan Board of Works, and superintendent of the gas examiners. I have for 25 or 30 years devoted attention to gas-works. At the beginning of 1869 I was appointed to my present office under the Metropolitan Board, and so far as the board are concerned, it is my duty to superintend the examiners appointed under the Acts of 1868-69, in the discharge of their duties. I am well acquainted with the question of testing the illuminating power of gas, and, though acting officially under the Acts of 1868-69, have considerable knowledge of the working of the 1860 Act, under which there still are six companies. The provisions of the Act of 1860 have never been put in force, so far as concerns the testing of gas. The result of those two different codes in different parts of London has been productive of very great inconvenience. For example, on the south of the Thames, the South Metropolitan Company are regulated by the provisions of the Act of 1869, and the gas is officially tested. The Phœnix Company, on the other hand, are under the 1860 Act; there is really no official examination of the gas made, and the price may be anything up to 4s. 6d. The standard in the former Act is 14 candles, in the latter 12 candles. That in my opinion is an unsatisfactory state of things, as persons living on the two sides of a street may be under very different conditions in regard to gas supply. I have heard, as a point of law, that there is some doubt about the London Company being under the 1860 Act.

The CHAIRMAN: Putting aside that point of law, have you, as an official, the same power over the London Gas Company (or, at least, do you attempt to use it) as you have over the Chartered?

Witness: No; we have always regarded it as being in the same position as the Phœnix Company.

Examination continued: The provisions of the Act of 1860 are that the gas shall have a standard power of 12 sperm candles, tested by a 15-hole Argand burner with 7-inch chimney, and that it shall not contain more than 20 grains of sulphur other than sulphuretted hydrogen. The maximum price is 4s. 6d., which may, in certain events, be raised to 5s. 6d. The Act of 1868, relating to the Chartered Company, prescribed a power of 16 candles. The two Acts of 1869, one applying to the Imperial Company, the other to the South Metropolitan Company, both gave a standard of 14 candles. With regard to the different test-burners, in 1860 the burner which was actually in use was a metal Argand having 15 holes and a 7-inch chimney, and this was continued, as far as I remember, up to 1863 or 1864. About this time the steatite burner, which is generally known as the Sugg-Letheby, was invented. This is also a 15-hole Argand with a 7-inch chimney, but differs very much from the metal burner. Comparing these two, there would be a difference of 1½ to 2 candles in favour of the 1864 burner. Since then there has been further progress made, and there is now a burner called Sugg's "London" Argand, which was invented after the passing of the 1868 Act. Gas that would give 16 candles tested with the most modern of the three burners, would not, I consider, give much more than 12 candles by the old burner. If we took 14-candle gas by the middle burner, it would be raised to 16 candles by the modern burner, and lowered towards 12 candles by the earlier burner.

The CHAIRMAN: Can you give us, without going into detail, the principle of the invention by which there was that great difference?

Witness: I think I can; of course, getting the illuminating power out of gas is entirely a question of combustion; the light in ordinary lighting gas is produced, or is supposed to be produced, by the simple ignition of the carbon which the gas contains. The amount of light that can be produced depends entirely upon the way in which that ignition is brought about; if the carbon is not sufficiently ignited—that is to say, if it is not made sufficiently white hot, so to speak—it passes off in the state of smoke, and then we get the ceiling blackened, and the usual effects of badly burned gas. If, on the other hand, the gas is overburned—that is to say, has too much air supplied to it—and the combustion is excessive, then the carbon is brought into a state in which it does not give that bright light which it ought to give. The proper making of a gas-burner is to hit just that happy mean, and it appears to have been done, according to my judgment, in the last burner. In the old burner of 1860, the gas was overburned; in the second burner the defects of the old metal burner were remedied to some extent, but the difference of conditions was not carried sufficiently far, and it is only in this last burner that what I may almost call the perfection of burning gas has been obtained, for I think this is a very excellent burner which is not likely to be surpassed.

Mr. BIRLEY: Is that burner equally applicable to all the qualities of gas?

Witness: I do not think it would hold its position with a very low quality gas, and it is not suitable for burning cannel gas.

Examination continued: When the Act of 1868 was passed, it was left to the referees to prescribe the burner by which the gas was to be tested. At that time the London Argand burner, I am distinctly told by the inventor, was not in existence. So that the discovery of that burner since has the practical effect of showing as 16-candle gas what was only 14-candle gas within the meaning of the Act.

The CHAIRMAN: Does this new burner, which brings out the 16-candle illuminating power, consume the gas in any shorter time than the other?

Witness: No; that is a matter which is defined in the mode of testing; the gas is always burnt at the rate of 5 cubic feet per hour.

Examination continued: In my opinion to arrive at a satisfactory result, not only should the illuminating power be prescribed in the Act, but also the very burner by which it is to be tested. I think the proper course is to have a model of the burner deposited with the Warden of the Standards, so that it can be referred to at any time. Disputes have constantly arisen with reference to the burner, and with regard to the old burner no two authorities were ever quite agreed about it. I think clause 23 of the proposed bill, which prescribes the deposit of a burner with the Board of Trade, a most essential provision. The consumers may use any burner they please, the test-burner has nothing to do with them. But so long as the gas is tested by it a constant quality will be supplied to the consumers. At all events, it will entirely get over any dispute as to the character of the burner, and also overcome the difficulty which arose under the 1868 Act, in which the burner was prescribed to be one which was suitable for use by the ordinary consumer. A good deal of difference of opinion arose upon that question, and I think it will be entirely got over by depositing the burner. The price of that Argand burner is about 5s. or 6s., whereas the ordinary flat-flame burner only costs a few pence. The first of the following tables is prepared from returns made to me by the various testing officers under the vestries, in relation to the companies that remain under the Act of 1860. The second is in relation to the companies under the 1868-69 Acts:—

Companies which, by Sec. 25 of the Metropolis Gas Act, 1860, are under the Obligation of giving Common Gas of an Illuminating Power of 12 Sperm Candles from a 15-holed Argand Burner, as described in the above Act.

Name of Company.	Mean Lighting Power of the Gas.	Description of Burner used for Testing.	Equivalent by "London" Argand Burner.	Sulphur not Sulphuretted Hydrogen.	Sulphuretted Hydrogen.	Ammonia.	Meter-rents charged.	Price of Gas per 1000 Cub. Feet.
								s. d.
Phœnix	Lambeth ... 14·66	15-holed Argand of 1860.	16·66	No test.	None.	None.	Yes	4 6
	Newington—							
	Vauxhall*	.....	15·59	.....	Ditto.			
	Blackfriars* ...	.....	15·22					
London	Lambeth ... 14·28	Ditto...	16·28	Ditto...	Ditto.	Ditto.	Ditto...	4 6
	Newington . 14·70	Ditto...	16·70	Ditto...	Ditto.			
	Chelsea .... 14·70	Ditto...	16·70	Ditto...	Ditto.			
Surrey Consumers	..... 13·58	Ditto...	15·58	Ditto...	Ditto.	Small quantity	Ditto...	4 6
Independent	For month of Dec., 1873. 14·19	Ditto...	16·19	Ditto...	Ditto.	None...	Ditto...	3 6
Ratcliff	..... 13·50	Ditto...	15·50	Ditto+..	Ditto.	Ditto...	Ditto...	3 9
Commercial	Poplar .... 14·00	Ditto...	16·00	Ditto...	Do.	None by qualitative test (1860) .	No ...	4 0
	Shadwell ... 14·00	Ditto...	16·00	Ditto+.	Do.			
	Mile End... 14·30	Ditto...	16·00	Ditto...	Do.			

* The gas in these cases is tested by the new "London" Argand burner.

+ A special examination of these gases was made in the second week in January for sulphur. The Ratcliff Company's gas contained 32·5 grains per 100 cubic feet; the Commercial Company's gas contained 36·0 grains per 100 cubic feet.

Table showing the Monthly Average Lighting Power of the Gas supplied in the Metropolis by The Gaslight and Coke Company, the Imperial Gaslight Company, and the South Metropolitan Gaslight Company during the Year ending the 31st of March, 1875; the Gas being tested under the Provisions of the Gas Acts of 1868 *and* 1869.

Date.	Gaslight and Coke Company.		Imperial Gas Company.				South Metropolitan Gas Company.
	Beckton Station.	Notting Hill Station.	Chelsea Station.	Camden Town Station.	Dalston Station.	Bow Station.	
1874.	Candles.	Candles.	Candles.	Candles.	Candles.	Candles.	Candles.
April	17·36	..	16·84	15·37	17·22	..	16·70
May	17·51	..	16·89	15·67	17·40	..	16·60
June	17·31	..	16·57	16·41	18·66	..	16·30
July	17·71	17·13	16·72	15·36	18·62	..	16·37
August	17·85	16·70	17·04	16·40	18·05	..	16·59
September	18·43	16·33	16·90	16·45	17·11	..	16·78
October	17·67	16·53	16·72	15·87	17·28	17·68	16·53
November	17·43	16·67	16·71	15·53	16·04	18·04	16·58
December	17·27	16·68	16·62	15·49	15·34	16·36	16·14
1875.							
January	17·60	17·10	16·58	15·96	17·21	16·45	16·08
February	17·31	16·72	15·92	16·18	16·82	16·27	15·85
March	17·21	16·93	16·02	15·99	16·75	15·95	15·89
Average for the year.	17·55	16·81	16·62	15·89	17·30	16·79	16·36

Examination continued: Under the 47th section of the City of London Gas Act, and under similar sections of the Acts of 1869, it was prescribed that the testings should be at certain times. I do not think that was a good provision. I think there should be no limit to the time during which gas could be tested under the authority of the Metropolitan Board or the Corporation.

Mr. TALBOT: Do you mean at any time during the day or night?

Witness: Yes; up to say ten o'clock. My reason is that a considerable amount of gas is burnt during the day in courts and places, more especially in cellars, in the City; and I think the gas which is supplied in the day is not quite up to the standard.

Examination continued: I think, having regard to the provision of this bill, that the average of the tests may fairly be taken as the illuminating power of the day. So far as the testing of the ordinary burning of gas goes, an excess of pressure is not at all necessary; the amount put in the bill is quite sufficient, and the clause is a mere copy of one in the Act of 1868. As to the taking of the pressure, I think the clause, as it stands in the bill, ought to be altered slightly. I think the pressure should be taken in the testing-room; it is impossible to take it at the junction. In the testing-places we have already every convenience for that, whereas the testing of the pressure at the junction of the service with the main would involve taking up the street. The pressure-gauges are at the testing-places, and no alteration whatever of apparatus would be required. As to the amount of impurity in the gas, I should leave it to the referees, as in the later Acts, rather than define the amounts, as in the 1860 Act. There is very much less, when the referees have the power of prescribing, than under the Act of 1860. At one time it did not work satisfactorily, but I think the standard of purity (that is, referring to sulphur always as impurity) which the referees have fixed is a very fair standard for the present. It is one of those things which will change as science advances, but for the present it is a fair standard. The lowest standard only came into operation on the 25th of March last. In fact, by not defining in the bill a hard and fast line, the consumers will have the benefit of any discoveries that may be made in the science of purification. Under the Act of 1868, the gas is to be tested at certain places situated within, or as near as may be to, 1000 yards of the works. In the bill the principle enumerated is that the test shall take place in the district where the gas is consumed. This is, in my opinion, an improvement. I think it ought to be tested in the district which is served.

The CHAIRMAN: Will you give us a reason why you think so?

Witness: I have found by experiment that gas which is delivered at a distance from works is not always up to the prescribed standard. I do not myself know the reason, but I know that it is a fact, and think that it is only fair to the consumers that the gas should be tested where it is burnt.

Mr. BRASSEY: Would the inferiority amount to one candle?

Witness: I have found the difference amount to more than two candles at a distance of several miles from the works.

The CHAIRMAN: May that arise from something having come into the main?

Witness: No, I think not, and previous experience seems to show me that

ordinary gas does not lose by passing along a main some few miles in length. I only know it to be so, and cannot give the reason.

Cross-examined by Mr. RICHARDS: I do not say that gas, in a long journey, deposits none of its illuminating power. I will tell you exactly what my experience is founded upon. Some years ago I made a good many experiments upon the state of the Bow Common gas after it reached London. It happened at that time that my laboratory in the City was at the very end of their services, and I think we never found the gas to lose more than about 3-4ths of a candle. I never heard Dr. Letheby say that in about four miles it would lose about a candle and a half, and I should prefer holding my own experience of the thing. I do not know that the "1000 yards, as near as may be," from the place of manufacture was introduced at the express instigation of the Metropolitan Board of Works in 1868 and 1869. If I remember rightly, it is in the Act of 1860, but it is rather vague, and is put a little more distinctly in the later Acts. I know that several stations, in compliance with the Acts of 1868-69, have been already selected and used by the companies, having been approved by the Metropolitan Board. Those stations have cost a considerable amount of money. Generally speaking, I think in all cases but two, these stations are in the districts in which the gas is being burnt. I think the amount of impurity in the gas should be left entirely with the referees.

Mr. RICHARDS: Is not the result of that that the referees, by imposing (I do not say they would do so) extremely stringent terms upon the company, may constantly inflict penalties upon them, all of which would have to come out of the dividends?

Witness: I suppose the referees, as public officers, are understood to be doing their duty, and if they act to the best of their judgment they can always avoid that, as they have up to the present time.

Cross-examination continued: I think that power might fairly be left to them, and I will give you a reason for it. In the Act of 1860 the standard of 20 grains was prescribed, but the provisions of the Act have never been enforced with regard to sulphur, and nothing was done in the sulphur question until the Act of 1868 was passed. Since then the question has been dealt with, and I think at the present time the standard fixed by the referees is a fair one. The referees could examine into the question, and if they found reason to lower the standard they would probably do it. I know that if the companies are a decimal point above what the referees fix, the penalties are enormous; but I know at the same time that, during the experience of several years now, the thing has not worked in that way at all. Over and over again companies have been some small amount above the standard fixed by the referees, but there is a protection in the Act which relieves them. They have a power of appeal to the chief gas examiner; and if he, upon inquiry, finds that the excess arose from accident, or from some cause which the companies could not prevent, he can relieve them from the penalty. The vestries are, I suppose, in fault in allowing the Act of 1860 to fall into desuetude, as far as testing is concerned. Clause 27 of that Act shows that any local authority taking a supply of gas has the power of testing by a competent person. It is no fault of the companies that this power has never been exercised. The power of the vestries is very clear, and the mode in which they are to exercise that power is clearly pointed out. The table I have put in shows that, under the 1860 Act, the gas supplied has been pretty good, and there has been no great cause of complaint. The 12-candle gas of the companies working under that Act, if tested by the Sugg-Letheby burner of 1864 would be about 14-candle gas.

Mr. RICHARDS: Let me read to you the words of Mr. Sugg himself, the inventor of the burner. Mr. O'Malley, I believe it is, asked him in 1867, "As you are a manufacturer, I would rather have it now, when you are not prepared; and I ask you what is the difference between the ordinary burner which was in general use in 1860, and your improved burner?—*A.* No difference at all. *Q.* Is there no improvement in your burner by the fact of its having a steatite top?—*A.* I put into an old 15-holed burner a steatite top, and therefore there can be no difference. It is the same 15-holed burner; the only difference is that there is a steatite top instead of an iron one, but the results in illuminating power are identical." Those are his answers.

Witness: If you would allow me to read an extract from a report of Dr. Letheby on the same thing, you will find he says that there is a difference of 11 per cent. between the two; and, besides that, no man would take these two things in his hands, and not see that there was a difference.

Mr. RICHARDS: What I have just read to you is Mr. Sugg's statement.

Witness: I have nothing to say, of course, to Mr. Sugg's statement.

Mr. RICHARDS: Do I understand, then, that you propose, in the case of two companies who established 14-candle gas in 1869, to convert their illuminating power into 16-candle gas?

Witness: I do not think that there would be much conversion in it.

Mr. RICHARDS: According to your statement, as I understand you, they are now able to show 12-candle gas as 14-candle gas?

Witness: What I say is this, that by the provisions of this intended Act these two companies would be put under a standard of 16 candles instead of 14, that is so far as the law is concerned. But I should like, if you will allow me, to go a little farther than that. In the year ending March 31, 1875, the Imperial Gas Company gave an average for the year at the Chelsea station of 16·62; at the Camden Town station of 15·89; at the Dalston station of 17·30; and at the Bow station, for the half year, of 16·79. Therefore they have very far exceeded the 16-candle standard.

Mr. RICHARDS: That shows that under the 14-candle limit, working under the threat of penalties, they have given an excess of what they were compelled to give. Therefore, because they have done well at 14, you propose to raise them to 16, under penalties?

Witness: I do not follow any such course of reasoning at all. I have always thought that 16-candle gas is the proper standard, particularly when tested by the new burner. It is only sufficiently high to be useful for common purposes, and it is not too high to press very much upon the gas companies. If you go beyond that standard, then you come into the question of using large quantities of cannel coal to raise the power of the gas, and that, I think, ought to be avoided. I consider 16 candles a very fair standard for that reason.

Cross-examination resumed: In 1868 the Chartered Company took a price of 3s. 9d. with 16-candle gas. In 1869 the Imperial and South Metropolitan Companies were confined to 14-candle gas, at prices for the former of 3s. 9d,, and for the latter of 3s. 6d. I hardly think that almost all the Imperial testing-places would have to be removed under the proposed Act. I think it would be quite sufficient if the testing-places were put within the district where the gas was to be burnt.

By the CHAIRMAN: The 7th clause of this bill prescribes 16-candle gas. I do not think there is any reason for attempting to obtain a greater illuminating power than that, which would be a fair and good standard tested by the last burner. It is possible, but I am not prepared to say there are consumers who would desire more. Practically, there is not much complaint. I know the illuminating power of gas in some of the large provincial towns. Broadly, in the North, where they approach the cannel coal districts—for instance, in Edinburgh, Manchester, and other large places—cannel coal is very much used. In Aberdeen, I am informed, the gas sold there by the corporation has an average illuminating power of 30 candles. I think for ordinary consumers it is of no advantage whatever to have gas of that high character; in the first place, it requires very careful burning, and, unless burners of a particular description are used, the gas is incompletely burnt, and it gives rise to smoke and blackens the ceiling and soils the furniture of the houses. Formerly cannel coal gas was made to some extent in London by three of the companies, but I think, now-a-days, it is entirely disused excepting in one case; it is now made by The Gas-light and Coke Company at the old Equitable station, but it has been abandoned in every other case. I think it is supplied to this House, but I am not quite sure; I almost think that if it were not so it would be given up entirely. It used to be supplied to large establishments, such as the Post Office, and some other places, but I think it is given up now. The amount of sulphur compound which we are dealing with as impurity in this bill is a changing thing. The standard might be applicable to-day, but by some discovery it may be possible to-morrow to lower it, and therefore I would leave it to the referees. I would hardly say that discovery has reached its end, as it were, as regards the burner, but I think, at all events, it has gone very far, and do not think it likely the burner will be improved at present. At all events this is a very excellent burner, and it would be better in the course of a few years, in the event of a better being discovered, to come to Parliament for an alteration of the burner. This is preferable to inserting a clause giving the power of having it changed if it were found necessary, as it is difficult to say in what hands you would place that power; it might, of course, be in one of the Government departments; but it seems to me it is not a thing which is likely to change, and it would be better to leave it to a fresh Act of Parliament when the time comes. I propose that three of these burners should be made; that one of them should be deposited with the Metropolitan Board of Works, one with the Corporation, and the other (certified by one of the Secretaries of State, or by the President of the Board of Trade) with the Warden of the Standards; then there can be never any dispute. I may remark that very great objection to this burner was made upon the ground that it was not suitable for use by the public; as the bill stands, that difficulty is done away with. In one or two cases the mains of our company are carried across those of another company, but I should think, as they are so well laid, free from numerous junctions, the leakage is not likely to be great.

By Mr. RICHARDS (through the committee): There is a burner in existence, called the Silber burner, alleged by many people who use it to be better than Sugg's burner. I should not allege it. I do not think it is better. It is a burner constructed very much on the same principle indeed as Sugg's burner.

Mr. BRISTOWE: I have not quite understood at present why you suggest that there should be a parliamentary test, as it were, set out in this Act as to the burner. For instance, we will suppose that the engineer of one of the companies invented a burner which experience should show to be an improvement upon the one set forth in the Act; why should the companies be prevented from using it, if, as might be the case, the referees themselves should be of opinion that it was an improvement?

Witness: In the first place, I think that must come entirely from some authority; a mere invention of a thing of that kind by a gas engineer would not entitle it to be used as a standard.

Mr. BRISTOWE: Clearly not, but I cannot understand the reason why, under this bill, you should propose the burner should be fixed, and the test of purity should be left to the discretion of the referees.

Witness: The question of purity is one which may be changing from day to day. For instance, up to last March the standard was 25 grains for a certain set of companies, and 20 grains for another set; now the standard is 20 and 15, and it is possible that next year we may even have a lower standard than that. It will depend entirely upon certain investigations which are always going on, but with the burner it does not appear to me that it is so. This burner is extremely good as a test-burner, and though, of course, the companies are entitled to obtain the greatest advantage they can, I think that must be taken with certain limits. Supposing that, if it were possible to contrive in the laboratory an apparatus by which the burning of gas would be more complete by bringing in heated air, or in some other way, and that that system was necessarily confined to the laboratory, I do not think the gas companies would be entitled to have their gas tested by such a system as that. I think the burner used for testing the gas should have a fair relation to one in ordinary common use. The only objection to this burner for common use is that it is very delicate in its arrangement; the quantity of air thrown into the flame is exceedingly well regulated, and, therefore, the slightest movement in the air will disturb the burning of the flame. That is why it is not suitable for ordinary use in a wide sense, but still it is most excellent as, and answers all the purposes of a test-burner.

The CHAIRMAN: The chief object of this clause, I suppose, is not to prescribe a certain burner for use, but to fix a certain test-burner, which shall apply to all the metropolis, so that it should be known that the gas comes up to a certain excellence?

Witness: That is my view exactly; and it seems to me that this burner at present entirely fulfils the conditions of such an one. It is an extremely good photometrical burner. It is a mere question of establishing a standard for the time being; perhaps a few years hence it may be found desirable to change it, but I think that is not likely to come about very soon.

Mr. BRASSEY: Do the consumers, for their ordinary domestic use, employ the most advantageous kind of burner?

Witness: They do not, indeed; on the contrary, they employ very often extremely disadvantageous burners, and lose a very large proportion of the lighting power of the gas in consequence. That is, of course, their own fault. I should think the public are in some degree deterred from using the best burner by the price. The ordinary burner is a very cheap thing indeed.

The CHAIRMAN: I am not suggesting for a moment that I suppose that the companies are so influenced, but looking simply to the fact that it is their interest to get the greatest possible consumption, it would be rather their interest that there should be a bad burner than a good one, would it not?

Witness: I should say personally that the companies are not influenced by any such consideration, but such would be the tendency, no doubt.

Mr. BIRLEY: I was going to ask why it would not be better that the standard burner should be a burner absolutely suitable for ordinary use?

Witness: Then you get away altogether from the principle that the companies are entitled to have their gas made the most of, because if you use one of these burners which are more clumsy in their construction and in the adaptation of their parts, of course, though it can be used ordinarily, it does not develop the lighting power of the gas.

Mr. BIRLEY: What sort of burners do the Metropolitan Board use for their street-lamps?

Witness: They are cheap common flat-flame burners. Not the best character of burners.

The CHAIRMAN: Why is that the case?

Witness: It would be impossible to use an Argand burner in a common street-lamp; the flame would be blown about and flickering, and the light would be destroyed. The only burner fit for that purpose is what is called a fish-tail burner, which is rough in its parts, so to speak, and where the adjustment of air to the flames is not a matter of great nicety.

The CHAIRMAN: How is it in a poor man's dwelling-house?

Witness: As a rule, I should think the poor are not consumers of gas. They use paraffin lamps almost entirely. In the North it is the practice to put gas-fittings into houses, but not so here.

Mr. BRASSEY: Since 1860 has there been much or any improvement in the process of manufacturing gas?

Witness: I think not. I do not think the process has varied much. It is a question of machinery and appliances more than anything else; but the broad principle of gas-making has been very little changed for many years past. With regard to purification a good deal has been and still is being done.

Mr. BRISTOWE: If there has been so much improvement in purification, I do

not exactly understand why there should not be progressive improvement in the manufacture of the burner.

Witness: I dare say there will be; but I do not think at present we can look for any great improvement that would influence the determination to deposit this burner as a standard.

By Mr. TALBOT: The gas supplied by the Chartered Company is of a higher standard than that supplied by other companies, and therefore it certainly ought to give more satisfaction to the consumers. The real difference between them is not great. The mean lighting power of the Chartered Company's gas from Beckton for the year ending March, 1875, was 17·55 candles, from their station at Notting Hill it was 16·81 candles.

By the CHAIRMAN: The Imperial Company have four stations. Their lighting power was from Chelsea station, 16·62 candles; from Camden Town, 15·89 candles; from Dalston, 17·30 candles; and from Bow, 16·79 candles. The South Metropolitan Company's gas was 16·36 candles at the same time. I do not know that a common observer would see any difference in the shops or streets going from the Chartered district into that of the Imperial Company. There is a variation of about one candle.

Mr. TALBOT: Between 17 and 15 candles would there be a perceptible difference in the illuminating power?

Witness: Not in the street, I think; but in a room you would find it out.

Mr. BRISTOWE: The variation in the London Company's gas is still greater, being from 12 to 16 candles?

Witness: The parliamentary standard of that company is 12 candles, but they give more than that. Brought to the standard of the new burner it comes to 16·28, 16·70, and 16·70.

Mr. TALBOT: I have heard it stated that the gas supply in London is inferior to that in many provincial places. Are you aware whether that is so or not?

Witness: If you refer to towns where they are burning cannel gas there will be a great deal of difference, but if you mean towns where they burn common gas, I believe the London gas is better than that of any provincial town.

Serjeant SARGOOD: Two or three witnesses have been asked if they could give the price and illuminating power of provincial gas companies. In the 1867 report of Mr. Cardwell's inquiry is a list of 18 companies with all that information.

Witness: This table is a perfectly useless thing, because we do not know what the burners are that have been used. According to it, it would appear that the gas is not better than London gas, with the exception of the cannel gas, which, of course, belongs to a higher standard altogether.

Mr. *Charles Heisch*, examined by Mr. PHILBRICK.

I am professor of chemistry in the medical college of the Middlesex Hospital, and superintending gas examiner to the Corporation of the City of London. I discharge very much the same duties within the City area as Mr. Keates does outside, in the Metropolitan Board of Works area. For many years the subject of the supply of coal gas has attracted my attention both scientifically and also on account of my position as gas examiner. I have watched the course of legislation, so far as it has affected the particular duties I have had to perform. The burner of the Act of 1860 was so ill defined that it might be anything, but, on the average of the burners used, the burner of 1864 certainly did show an improvement of nearly two candles. I certainly agree with Mr. Keates that the burner invented by Mr. Sugg since the Act of 1868 shows a progressive increase over the burner of 1864. So that, speaking without regard to fractional points, one may say that the 12-candle gas of 1860 is the 16-candle gas of the present day. I think it would be fair for the metropolis to fix 16 candles, measured as at present, for the illuminating power. I think a fixed standard far preferable to one which might vary from time to time at the discretion of a body of referees or examiners. Of course, if the standard be fixed, whether or not an improved burner, that gets more light out of the gas, is invented, it certainly does not prevent it being used. It merely determines that the gas shall be of a uniform quality independently of the burner. Therefore it does not matter what burner is taken for a standard so long as it is uniform. I do not think the burner, to be the test-burner, should necessarily be one which is in common use by the public, or adapted for their use. Supposing any scheme of legislation fixes a price, having regard to illuminating power, I do not think it would be right that, as improvements in showing that power are effected, the conditions should be altered without alteration in price. With regard to what actually has happened, there has comparatively been no improvement in the gas; but gas which would in the present day conform to the standard of 16 candles, as now tested, would be considerably worse than gas of 16 candles tested by the 1864 burner, and still worse if tested by the 1860 burner. Gas which by the present burner—Sugg's "London" Argand—gives 16 candles illuminating power, would give about 12 candles by the old 1860 Argand burner. As to the testing-places, I think they ought to be in the district where the gas is consumed. For the City they are now seven miles off. I would desire to have them in the City, which would not practically work unfairly to the companies. As to the times of testing, they ought to be left to the local authorities to test within practicable hours. The principal reason I have for wishing that is, that we find the gas at other than the hours of testing is not the same as it is at the hours of testing, and these hours are not those at which the greatest amount of gas is consumed in the City. The present hours, as prescribed by the Act, are in winter between the hours of five and ten in the evening, and in the summer between the hours of eight and eleven. Judging from the supply of gas at the testing station, I should say it was possible for the manufacturer to alter the illuminating power in a comparatively short time. I have seen as great a change as three candles in less than half an hour in the testing station at Beckton.

The CHAIRMAN: Are you practically acquainted with the manufacture of gas?

Witness: I am partially—I do not say practically—acquainted with it. I cannot tell in what way there could be that quick change. I can only tell what I have observed.

Mr. PHILBRICK: As a matter of fact, the result, as tested by you, has been to show there has been that change within so short a space of time as half an hour, or thereabouts?

Witness: Yes. I have tested the gas myself at half-past four o'clock, and found it less than 14 candles, and at a few minutes past five it has been between 16 and 17 candles.

Cross-examined by Mr. RICHARDS: That has been when testing at Beckton, at the station, 1000 yards from the works. Newcastle coal will not produce 16-candle gas unless by the admixture of cannel, which is a very expensive article in the hands of a limited number of people.

Serjeant SARGOOD: I suppose you know enough of gas manipulation to be aware that the companies themselves are repeatedly testing the illuminating power of their gas, in order not to get into difficulties?

Witness: Certainly.

Serjeant SARGOOD: This experience of yours is very astonishing to me, that between half-past four and five o'clock, or a few minutes afterwards, you found two candles difference in the illuminating power. Let me ask you whether that is merely an exceptional incident that you quote to show the possibility of changing, or whether you mean to suggest you have frequently found it?

Witness: I have seen it many times. I should say you might find it, certainly, once or twice a week over a continuous number of months.

Serjeant SARGOOD: Then you must have seen it a great many times; how many days a week do you test?

Witness: I do not myself carry on testings every day at all.

Serjeant SARGOOD: Then forgive me if I ask you on whose authority you say that the testing of the illuminating power has proved this rapid change in a short number of minutes?

Witness: I state that on my own authority, on the occasions when I have been down to Beckton.

Serjeant SARGOOD: How often have you discovered that enormous change?

Witness: I could not say how often, but very frequently.

Serjeant SARGOOD: Have I understood you to say that you have discovered it yourself once or twice a week for a continuous number of weeks?

Witness: I say that I have myself seen it very often, and I should think from the tests which have been made by our official tester, as well as by myself, that that may be about the number of times that it would occur.

Serjeant SARGOOD: How often do you go to Beckton?

Witness: It is quite uncertain; sometimes once a week, sometimes twice a week, and sometimes not so often.

Serjeant SARGOOD: What is the object with which you personally go there?

Witness: To examine the state of the apparatus, to see that it is all in proper order, and to see that the official tester is doing his duty. This gives me an opportunity of testing, or seeing the testing, at the moment, and it is on those occasions that I have made these discoveries.

Serjeant SARGOOD: I suppose it occurred to you that this was a very dangerous power for the company to possess, as against the consumer?

Witness: It certainly is.

Serjeant SARGOOD: Did that occur to your intelligence when you discovered it?

Witness: Yes, certainly—that it was objectionable.

Serjeant SARGOOD: Did you make any special report, to those who employed you, of the dangerous position in which they stood when you ascertained this?

Witness: Certainly, several times to the Gas Committee of the Corporation.

Serjeant SARGOOD: Have you made a written report to the Gas Committee that you have discovered the quality of the gas to be changed to the amount of two candles within 30 or 40 minutes?

Witness: Yes, I have reported that repeatedly, verbally, and I think on one or two occasions in writing, but I am not quite certain about the written reports.

Serjeant SARGOOD: As written things are the most valuable, can you tell me when you made such a report?

Witness: I could not refer you to a written report.

Serjeant SARGOOD: I am not attempting at all to throw a doubt upon your evidence—I am sure you would not misrepresent anything—but as we are ourselves testing continuously, in order to avoid penalties, and as we never had this experience ourselves, I want to see what steps you took when you thought you had discovered this change in the illuminating power. Did you say anything to the company when you were at Beckton, and challenge them to explain what it meant?

Witness: Penalties do not begin until the regular testing hours, and I am speaking of times before the regular hours of testing.

Serjeant SARGOOD: And you were endeavouring to infer that what could be done out of testing hours, and which you discovered being done without any ostensible motive, could be done within the testing hours when there was an ostensible motive, if I follow your train of thought?

Witness: No; my train of thought was this, that we ought to have the testing hours extended, and to test at times not fixed, because out of the testing hours we find things different from what they are in the testing hours.

Serjeant SARGOOD: And finding that out of testing hours, when there was no motive to make the change, it was so suddenly made, it occurred to your mind that they might make the change in the testing hours, and that it was dangerous?

Witness: I do not see the danger of its being done in the testing hours, except to the company, because their gas might go down.

Serjeant SARGOOD: Did you take any step at all by pointing this out to the companies, and saying, "What does it mean? I am the proper examiner in the protection of the public interest, and I challenge you to explain to me at once the meaning of what I have discovered"?

Witness: So long as the companies supply, during the testing hours, the gas which they undertake to supply, I make no communication to them.

Serjeant SARGOOD: I am glad to have relieved the company from the shadow of imputation, which, however, you appear not to have intended to cast upon them. You do not mean to suggest that any unfair advantage of such a power has ever been taken?

Witness: All I mean to say is, that during the testing hours we get gas quite up to the mark, and out of testing hours I have often found it not so.

By the CHAIRMAN: The Act of Parliament prescribes that there shall be a certain illuminating power, taken upon the average of not less than three tests, within certain hours; not that there shall be a certain illuminating power during the whole time the gas is supplied.

By Serjeant SARGOOD: The Act requires a certain illuminating power between certain hours at certain periods of the year, as prescribed by the 47th clause. I have found the companies have always been up to their mark. I think I can refer you to a definite day and period of the day when I discovered the great change I have spoken of. On the 6th of April, at 20 minutes past four o'clock, the illuminating power was 15 candles; and afterwards, at the official testing, it was 17·7. On the 4th of March, at 10 minutes past four o'clock, the illuminating power was 15·2. Three testings were taken at half-past the hours of five, six, and seven, and the average was 17·2.

Serjeant SARGOOD: Then it seems to me to be perfectly rational, and within the prescription of the section, that, in the early part of the afternoon, when the consumption would not be so generally great, the test seemed to show a lesser power; but that when people began to use it within those limited hours, the gas was up to the power that was required?

Witness: I do not know anything about when people began to use it; the time at which people use gas depends so much on the district. In the City there is quite as much, and perhaps more, gas used in the day than there is in the evening.

Serjeant SARGOOD: I see the testing hours are regulated from April to September, and October to March, to meet a winter and summer idea?

Witness: Yes; but that does not meet our consumption in the City. In the summer a great deal more gas is used before, than during, testing hours, which do not then begin till eight o'clock. The inference I wish to draw is, that testing should be allowed at other times.

The CHAIRMAN: Do you read section 53 of the Act (which is not the section with respect to testing, but the one which prescribes the illuminating power) as saying it shall be of 16 candles merely between the hours of five and ten, or as saying that shall be the power of the whole supply of gas during the 24 hours?

Witness: I read it to be during those hours, because it says, "shall, subject to the provisions of this Act," which are that the testings shall be taken at those hours.

Serjeant SARGOOD: How many minutes would you be occupied at the testing-place on occasions such as you have described, when you have made what I call your unofficial tests?

Witness: I generally stay there two or three hours. That last test of which I spoke was one of my first experiments.

Mr. BRISTOWE: You said some time ago that there was a sudden change of either two or three candles. Was that sudden change during the testing hours, or antecedently to the testing hours?

Witness: The change has taken place sometimes quite antecedently to the testing hours, and sometimes even after the first official test has been taken, because by taking an average of the three tests there may be a margin. It has, however, generally occurred before testing hours.

Mr. TALBOT: Did you not state that the change occurred on one occasion

between two tests, the first of which was made before the testing hours, and the second half an hour afterwards, after the testing hours had begun?

Witness: The half-hour had commenced before the testing hours had begun, and ended after they had begun.

By Serjeant SARGOOD: This unofficial test was the first one, made perhaps half an hour after my arrival. In the testing-place there is a continual consumption of gas day and night, and this is done for the purpose of preventing anything like dead gas resting in the service.

Serjeant SARGOOD: As you do not burn by meter, some of our unaccounted-for gas seems to be turning up at last.

Witness: I think the testing-places have been charged with the unaccounted-for gas before.

Serjeant SARGOOD: Then this being an unofficial testing, although suggestive of some important ideas, you did not say anything to the company about it, or ask to be informed, though you were not gasman enough yourself to understand how it was done?

Witness: I did not.

Serjeant SARGOOD: Have you not at all worried your brain to try and find out the secret of this change, a change which you were very much interested in as a gas examiner?

Witness: That I may have done, but I am not going into speculations as to how it might be done.

Serjeant SARGOOD: But if you have worried your mind about it, will you give me any suggestion for the benefit of the committee, to the detriment of the companies if you will?

Witness: I do not want any detriment to the companies.

Serjeant SARGOOD: But if there is anything to be said to the detriment of the companies, fairly and openly let us have it out, and let us be heard in answer to it. What suggestion, if any, have you to make to the committee in reference to this discovery?

Witness: I have no suggestion to make as to how it is done.

Serjeant SARGOOD: But as to how it might be prevented have you any suggestion to make?

Witness: I think it might be prevented if the tests were allowed to be taken at all times.

Serjeant SARGOOD: Supposing that the three tests were to be made morning, noon, and afternoon, I do not exactly see how that would prevent this thing happening, which could be done, according to your account, in 35 minutes.

Witness: I never proposed that the tests should be taken at any fixed hours.

Serjeant SARGOOD: Then you would put the company under the same tests at eleven o'clock in the morning, when scarcely any one was using the gas, as you would at seven or eight o'clock in the evening, when the whole world are burning it full?

Witness: I think that to us in the City it is quite as important to have good gas at that hour as it is at night.

Serjeant SARGOOD: And at three o'clock in the morning you would apply the same test if you wanted it?

Witness: I do not think that any of us would go up and test it at three o'clock in the morning.

Serjeant SARGOOD: Do you know what the illuminating power depends upon in the manufacture of gas?

Witness: Upon the quantity of carbon in the gas.

Serjeant SARGOOD: Do you not think that your idea might induce a needless waste of raw material, if they kept up the same illuminating power at all hours of the day, and at every minute of every hour, when really the public do not require it?

Witness: There might be, perhaps, a little more expenditure, but it is just a question whether the public do or do not want it.

Serjeant SARGOOD: As a practical man, do you mean to suggest to the committee that it would be possible for a company, with any chance of avoiding the very serious penalties to which they are liable, to keep up their illuminating power continuously during every minute of the day, challenging you to go to an unknown period, and take your test whenever you liked?

Witness: The best answer I can give to that is, that there are companies who do so. In Dublin; and, practically, the Phœnix Company here does so.

Serjeant SARGOOD: Are they at the risk of an inspection of illuminating power at any moment the people choose to go?

Witness: Yes; and under heavy penalties if it is not up to the mark.

Serjeant SARGOOD: So that if the examiners choose to make their three tests at two, three, and four o'clock in the morning, and found them all failing, notwithstanding there might be splendid gas all the afternoon and evening, you would think it was a fair thing to the company to leave them open to the penalty?

Witness: I think it might be. I may mention that the Phœnix Company have a right to three hours notice before testing; but, under the direction of their directors, their secretary wrote to the clerk of the Board of Guardians of Lewisham, for whom I test the gas, to say that they would not require that notice, and that I could come when I liked, day or night. I do so; and I may add that I have never found any deficiency in the illuminating power of the gas. That company is under the Act of 1860.

Serjeant SARGOOD: I suppose, as you have made no communication to the company when you discovered this, that you may not be familiar with what their instructions to their chief engineer and their men are in reference to this subject? You are not aware that their special instructions are to be continually testing the illuminating power, so as to keep it up during the whole of the day and night to the right standard?

Witness: I am not.

Serjeant SARGOOD: That being so, I think I must trouble you now to give me from your book three or four dates and instances where you found these changes take place, so that we may have at least the fair advantage of examining into them ourselves.

Witness: I cannot, without reference, give you those that I have made myself, because they have spread over various times; but I can produce the official tester, if you like, who made those which I have in my pocket.

Serjeant SARGOOD: You may not have them all in your pocket, but will you be kind enough to refer to your book, and to give me at your own option, at any date you choose, and any hour you like, the particulars of any discovery of this description that you have made, in order that we may look to our testings of that day and hour, and see if we can find out the reason why this change occurred?

Witness: I will endeavour to find those notes for you by to-morrow, but I have not them in my pocket now. Those which I produced were made by the official tester at Beckton—the same man who tests in the evening.

Serjeant SARGOOD: If that is your experience, it is a very fair thing to mention it; but I must accept the challenge, and follow it up very strictly?

Witness: Quite so; but I cannot promise to produce those which I made myself.

Serjeant SARGOOD: I would rather have those than any, because I do know you, and I do not know whom else you might put up.

Witness: The official tester takes all the tests in the evening, and they are received as correct, and we can produce him very easily.

Serjeant SARGOOD: You were speaking of non-official testings, taken, as I may familiarly say, out of office hours; and as you are a non-official tester, but an equally competent man with the official tester, I would rather have your experience in office hours, and I think I am entitled to it.

Witness: I have done it on many occasions, but I cannot give you the precise dates. I may have them noted in a book at home, but I have not got them here. Those which I have here are made by the official tester.

The CHAIRMAN: But they are only made within official hours, are they?

Witness: No; those are made at other hours by my directions.

Serjeant SARGOOD: If you will give me your own experience I will follow it out, and see what account we can give of it?

Witness: I am afraid I shall not be able to give the dates when I have seen it myself.

Serjeant SARGOOD: Then I cannot at all check your inquiry, although I am quite sure that what you are giving is honestly intended.

Witness: I may have notes of it, or I may not; I will look for them.

Re-examined by Mr. CRIPPS: The 76th clause of the Act states that the report of the chief gas examiner on appeal, or the report of a gas examiner after the time for appeal has lapsed, and no appeal has been brought, shall be conclusive evidence as to the liability of the company to a forfeiture. In the ordinary course of business these tests are made by an examiner and reported to me. I have those here and am prepared to satisfy the questions asked, by showing those tests and producing the man who made them, if need be.

Serjeant SARGOOD: I do not object to their being produced by the man who took them, but I do not want to challenge your accuracy upon another man's report, and therefore I invite you to give me your own experience.

Witness: I am half afraid I shall not be able to produce the dates.

Mr. CRIPPS: If the matter is really disputed we will produce the gas examiner who made tests, although I should have thought that the report was quite sufficient. The 43th section of the Act says that the average of all testings of illuminating power prescribed by the gas referees on each day shall be deemed to represent the illuminating power on that day; do you mean that it is your impression that "that day," as represented there, merely means the day between the hours of five and ten or eight and eleven o'clock?

Witness: It appears to me it can mean nothing else, because they say the tests taken at those hours shall be deemed to represent the illuminating power of the day.

The CHAIRMAN: Do you read this Act, under which you work, as meaning that the companies fulfil all their legal requirements if they provide 16-candle gas between five and ten o'clock in winter and eight and eleven o'clock in summer?

Witness: I believe that they fulfil all their legal requirements by so doing; otherwise, why should they not subject themselves to a penalty for not supplying it at other times?

The CHAIRMAN: We should like to have it cleared up as to whether that is the legal requirement or not.

Mr. CRIPPS: When you come to put the Act into operation, the means of testing only extend to a certain number of hours.

The CHAIRMAN: I took it as you said, that it was prescribed for the whole day, but that the power of finding it out was limited to a certain time; but I understand that this witness, whose evidence is most important, because he ought to know the legal requirement which he is bound to see carried out, considers it only to apply between five and ten o'clock; therefore I gather, if he is right, gas of any power at other times would be within the legal requirements of the company.

Serjeant SARGOOD: Quite so, and you will find the interpretation clause gives you the meaning of the word "day;" it is from nine o'clock in the morning to nine o'clock the next morning.

The CHAIRMAN: How do you interpret the Act?

Serjeant SARGOOD: I interpret the Act as you put it, sir, that there is to be an illuminating power for a day of 24 hours, but the test is to be between more limited periods.

Mr. CRIPPS: We quite agree there, only I asked the witness to point out to you that there was a difference between our impression and his.

Mr. TALBOT: I understand, Mr. Cripps, that you and the learned serjeant agree; but I am sorry to say I cannot take the same view of the clause as you do. Of course, I assume you are much more likely to be right than I am, but what is the use of a requirement of a certain illuminating power for the day, if there are only certain hours in which you can test it?

Mr. CRIPPS: That is one of the omissions of the Act which we propose to alter in the present bill.

Mr. TALBOT: You assume it to be a lapse in the drawing of the Act?

Mr. CRIPPS: It may possibly have been intentional; if it was, no doubt the spirit of the thing is that you must have a certain illuminating power through the day.

The CHAIRMAN: It is important, because, if the witness's interpretation is the correct one, you would be asking that the companies should be put into a more disadvantageous legal position, because they would be called upon to give for 24 hours what at the present moment they would only be called upon to give for five hours; if, on the other hand, your interpretation, Mr. Cripps, is the correct one, you are only requiring from your point of view a more certain way of ascertaining whether they do fulfil their legal requirements or not.

Mr. CRIPPS: That is entirely the view which we take of it.

Serjeant SARGOOD: My idea is that the promoters of the original bill, in the interests of the consumers, took care that the testing should be at hours when the consumption was greatest.

Mr. CRIPPS: It was never intended that at the other times of the day there should be any other standard of illuminating power.

The CHAIRMAN: We have the fact that an officer of the corporation has not so interpreted the legal requirements of the Act which he was sent down to see kept up.

Mr. BIRLEY: Is that merely your own interpretation of the Act, or have you taken any opinion upon it?

Witness: I have taken no opinion upon it, but it appears to me, if the company were required to give gas of another illuminating power, there would be means of testing that they did so.

The CHAIRMAN: Were any instructions given to you by the corporation?

Witness: The instructions are given by the gas referees, and simply relate to testing between certain hours. They do not state one way or the other as to this difference of interpretation.

Serjeant SARGOOD: Do you not know perfectly well that the gas which you test is not gas made at the moment on the premises, but gas that is in the holder, and has been made during the last 24 hours?

Witness: It may be, not necessarily must be.

Mr. BRISTOWE: Do you contend, Mr. Cripps, that on the interpretation of this Act, taking clauses 47 and 48 together, the intention of the Legislature was to prescribe certain fixed hours between which the tests should be taken, and that the average of those three tests should determine the amount of illuminating power for the whole of the 24 hours?

Mr. CRIPPS: Yes.

Mr. BRISTOWE: Serjeant Sargood says, if I understand him aright, that the average tests are shown in section 47. He does not admit that he is bound to keep up that amount of illuminating power during the whole 24 hours.

Serjeant SARGOOD: On the contrary, I say that I am excused from keeping it up by this very mode of test. Otherwise I should, at four o'clock in the morning, when nobody wants any gas, be open to the penalty.

The CHAIRMAN: I do not understand Serjeant Sargood now as I understood him before. I will put an extreme case to test it. We will suppose that there may be in London, as there are in the North, factories that want light from six to seven o'clock in the morning, and that the gas which is supplied, instead of being 16-candle gas, is only 10-candle gas. If this witness is correct, it appears to me that the company would not be breaking their legal requirements, because they

would be supplying from five to ten o'clock in the evening gas that was up to 16 candles; and he interprets clause 48 to mean that that is to decide everything they have to do in the 24 hours. Do you think, Serjeant Sargood, that they would, or would not, be breaking their legal requirements, by having supplied only 10-candle gas at six o'clock in the morning?

Serjeant SARGOOD: If that was the amount of the test outside the prescribed hours, they would not, in my judgment, be breaking the law at all.

The CHAIRMAN: Then I was mistaken in supposing that you and Mr. Cripps agreed in the interpretation.

Mr. CRIPPS: I read it totally differently now from the way in which my learned friend reads it, though we agreed before.

Serjeant SARGOOD: The reason for it is obvious. We are under heavy penalties to supply gas of a certain illuminating power; the test is to be taken at the moment when our constituents most need it, and we are under a penalty if at that time it is not up to the standard.

Mr. CRIPPS: Section 48 says that it is the average of all the testings which shall be taken as the illuminating power on that day.

The CHAIRMAN: I do not think it is any use for us to argue upon the different interpretations. I suppose the promoters will make it part of their case that there is this difference of interpretation as to the law; and they have no guarantee that in the morning, when gas is wanted, it shall be up to the illuminating power that is required.

Serjeant SARGOOD: I admit that we have not, and I contend that Parliament intended to give them no guarantee.

The CHAIRMAN: Therefore the promoters clause aids the consumers, and puts the companies in a more unfavourable position than they are at this moment.

WEDNESDAY, JUNE 9.

Mr. *Arthur Gunn*, recalled.

The CHAIRMAN: Have you the information for which I asked with regard to the prices charged by companies supplying districts immediately next the metropolitan companies?

Witness: The prices in the year 1874 were: Crystal Palace District, 4s. 2d.; Brentford, 4s. 6d.; Woolwich (one of the two companies, I do not know which), 4s. 6d. to Michaelmas, and 4s. afterwards; West Ham, 3s. 9d.; Wandsworth and Putney, 4s. 6d. I do not know the illuminating power, but we can in a day or two get that information. For the first quarter of 1875, the charge was: Crystal Palace, 4s. 2d.; Brentford, 4s. 6d.; Woolwich, 4s.; West Ham, 3s. 9d.; Wandsworth and Putney, 4s. 6d.

Serjeant SARGOOD: Mr. Heisch yesterday produced some books which he said had been furnished to him by the official tester in the ordinary course of his business, but he said those books did not contain certain tests which he personally had made with regard to the illuminating power, but that the books were at home. I then wanted to see what documents he had, with reference to the subject, before cross-examining him. I think it desirable to follow out the inquiry.

Mr. *Charles Heisch* recalled, and further examined by Mr. CRIPPS.

I was examined yesterday with reference to the somewhat sudden rise in the illuminating power of gas which sometimes takes place. I produced some books which had been furnished by the gas examiner who reports to me. I said I had myself made tests establishing more or less the same point, but had not the dates for them. I have looked for the papers, but unfortunately they are not dated. I cannot find those papers at all; they were quite unofficial things, taken at unofficial hours, and I cannot find any notes of them at all. I am not sure I took any tests at all, but at the time I was speaking from memory.

Cross-examined by Serjeant SARGOOD: I have frequently, out of official hours, seen a difference of two candles in from 30 to 45 minutes. My official duty is to visit the stations and see that the apparatus is kept in proper order, and to go at uncertain times to see that the official testing is carried on properly. I have to advise the corporation on this subject, and also be a go-between them and the testers who are appointed by them and the Metropolitan Board. Those for the City are generally appointed on my recommendation. Holding that public appointment, it is my duty to take care of the interests of the public.

Serjeant SARGOOD: Did you not consider it a question of importance, in the interests of the consumers, to discover, as you thought you had discovered, that the illuminating power of gas could be raised at the testing-place two candles in 30 or 45 minutes? And notwithstanding you never kept any record of it?

Witness: Not of the precise dates, perhaps not of the precise facts. Some few of the unofficial reports taken out of office hours are preserved in a book.

Serjeant SARGOOD: It would be for you, as a chemist, to go and find out how that manipulation was accomplished; I will tell you fairly why. I am asking you that question; I believe it to be a physical and chemical impossibility. Did you try to find out how that wonderful change was accomplished in 45 minutes—I mean, unless by fraud?

Witness: What do you call a fraud?

Serjeant SARGOOD: What I call a fraud is an intentional tampering with the gas for the purpose of creating an amount of illuminating power to satisfy a test, which may be again thrown off after the test is made. I ask you whether you thought that of sufficient importance to try and find out how it was done?

Witness: I have asked various gas engineers how it might be done.

Serjeant SARGOOD: You say various gas engineers.

Witness: One or two, perhaps. I cannot say whether any of them will be called.

Cross-examination continued: The gas to be tested comes from the large gasholders, capable of holding many million cubic feet. I am not aware whether all these holders communicate with each other, but they all communicate with the main, which is much the same thing.

Serjeant SARGOOD: Have you sufficient knowledge of gas manipulation to suggest to the committee that it would be possible, even as regards one holder (and I will not embarrass you with more) to change the quality of the gas in one of those enormous holders, one of them containing a million cubic feet, to the extent of two candles, or anything approaching it, in 45 minutes?

Witness: I imagine it would be more simple to change the holder. Of my own knowledge I cannot say. They might change the supply from one holder to another of two candles higher illuminating power. I know that there is a large number of retorts, but I am not aware, of my own knowledge, that the pipes from these, conducting the gas to the holders, have a common centre into which all the retorts are emptied. If that is a fact, I still think that 14-candle gas might be supplied at one moment, and 16 at another, through the same pipe.

Mr. TALBOT: The allegation is that, on the 4th of March, at 10 minutes past four in the afternoon, the illuminating power was 15·2; at 40 minutes past three, which is exactly half an hour's difference, the illuminating power was 16·81.

Serjeant SARGOOD: I know that it is physically impossible that that change could have taken place except by fraud, and I want to know whether Mr. Heisch can suggest to me that that thing is possible. (To witness:) Do you know that?

Witness: I have told you already that upon the point of possibility I would rather not give an opinion. From what I have heard, I believe that it is possible. I believe it is possible to change the illuminating power of gas to the extent of two candles in 45 minutes delivered from the holder to the testing-place. I do not think it possible I could have made repeated mistakes in the matter.

Serjeant SARGOOD: May I ask why you did not preserve a record of what I venture to think is a very serious question?

Witness: I really do not know that I had any reason for it, except that, it being out of official hours, went for little or nothing; no action could be taken upon it.

Serjeant SARGOOD: If the thing was done out of office hours, it was capable of being done in office hours. Do you not think that is a very serious suggestion? If it could be done during the official testing, was not a record important?

Witness: It is doubtless a matter of importance.

Serjeant SARGOOD: Did you ever communicate with the gas company in this matter of testing, stating that you discovered the thing to be very unsatisfactory, and asking them to account for it?

Witness: No, I have not done so. I do not know that I ever stated it until yesterday.

Re-examined by Mr. CRIPPS: The tests I make are recorded in a book which is open at all reasonable times for the inspection of the company. The gas examiner reports daily to the corporation, the chief gas examiner, and the company, the average testings recorded in that book. That book does show a sudden rise in the illuminating power occasionally, but these are tests taken in official hours. Those which I produced yesterday were some of them made out of official hours as well. Although I have no memorandum of the facts, my memory is perfectly clear as to the considerable changes I mentioned. I have no record showing the result of the tests for illuminating power before office hours. If I may speak from memory, I may say that I am in the habit of constantly of testing the gas in the City of London for various purposes, and that during the day it seldom exceeds 15 candles.

The CHAIRMAN: Before you call the next witness, I should be very glad if we could clear up the exact legal position. We had a little conversation about it yesterday, and counsel appeared to agree and then to disagree, and I am not sure that counsel in every case gave just the same opinion. I mean that there was a difference of opinion from the same counsel. But as this is a matter in which fraud has been mentioned, I think we ought to have it cleared up, either by evidence, or in some way or another, as to what is the real position of the company, and whether they are, or are not, required legally to furnish gas of 16 candles outside the official testing hours. If they are not so required, I cannot see that there is any ground for an imputation of fraud in a change, however quick, from 14 candles in the non-official hours to 16 candles in the official hours.

Serjeant SARGOOD: When I say that there is an imputation of fraud, I mean not that there was any fraud committed out of office hours, but that a thing was discovered out of office hours which to the mind of the examiner suggested the idea that the thing could be done in office hours; and then I say that if it could be done in office hours it would be a fraud.

The CHAIRMAN: There is no imputation whatever that it has been done in office hours.

Serjeant SARGOOD: No; but here the question is clear. It is said that we have the power of altering the illuminating power by two candles, which I shall say by and by is a physical impossibility.

Mr. CRIPPS said he never had the slightest doubt that the obligation upon the company was to supply 16 candle gas during the whole of the 24 hours.

Serjeant SARGOOD said in his opinion the intention of the Act was to make an exception during non-official hours.

Mr. CRIPPS said he admitted that the penalty could not be enforced for a less illuminating power during the daytime.

Mr. *William Charles Young*, examined by Mr. PHILBRICK.

I am a fellow of the Chemical Society, and gas examiner at the Beckton station for the Corporation and the Metropolitan Board. My duty, as far as official testing is concerned, is to make tests at least three times a day, beginning not earlier than 5 and ending not later than 10 o'clock at night. These are recorded in a book, to which access can be had. I have made tests in other than official hours, and have found that the gas was under the power it should be at the time of testing. On Dec. 12, 1874, there was a rise between 3.30 and 5 o'clock of rather more than two candles, between 5 and 6 o'clock there was a rise of 2·41 candles. It was during the 6 o'clock test that the rise apparently took place, the first two observations being as low as the last observation of the previous test, and there was then a rise of nearly two candles in the observations. On Dec. 19, at 4.30 p.m., the gas was equal to 15·13 candles, at 5 it was 16·77, at 6 it was 18·18, and when the official test of that day was taken, at 7 o'clock, it was 17·67. With the proper correction, the average illuminating power, as reported, was 17·4 candles. The testing at 4.30, of course, does not enter into that calculation. That 15·13 corrected would work out to 14·93 candles.

By the COMMITTEE: The correction is made on account of the barometrical pressure and the temperature, both of which affect the volume of the gas.

By Mr. PHILBRICK: If the barometer is high and the temperature low, the correction will make the power of the gas lower, and *vice versâ*.

By Serjeant SARGOOD: The figures by which we test our corrections are to be found in the instructions given by the gas referees.

By Mr. PHILBRICK: I have frequently tested, in unofficial hours, at the Beckton station, and have found the gas as high as 17·1 candles. That was at 10.40 p.m., on March 2, 1875, after official testing hours. Before official testing hours I have seldom found it over 16 candles; it is more often much below.

By the COMMITTEE: I have tested as early as 9 a.m. It was 16·2 and 16·3 at that time on Nov. 28, 1874. The lowest was at 11 a.m. on Feb. 25, 1875, when it was 12·87 and 13·1. I have no summer testings. These have been made from the end of Nov., 1874, to April 8, 1875. On that day, at 3.50 p.m., it was 15·68 candles, at 4.25 it was 15·94, and at 8.30 it was 16·92 candles. That was the first official test of that day. The second, at 9.30, was 17·1; the third, at 10.30, was 18·04; the average for the day being 17·5. On the 2nd of March, at 10.40 p.m., the gas was 17·1, and at 11.40 p.m. it was 16·16 candles.

By Mr. PHILBRICK: I have also taken tests of illuminating power at Mr. Heisch's office in the City. The same process is there used as at the testing station. The same burner was used, but the photometer was of a different form.

Mr. PHILBRICK: Can you tell what generally has been the result of your testings as to the illuminating power in the daytime?

Serjeant SARGOOD objected that they were unofficial testings at an unofficial place, and ought not to be taken.

Mr. PHILBRICK did not press the question.

Cross-examined by Serjeant SARGOOD: I think it possible that the corrections of the testings by themselves make a difference of more than a candle. I have, both during and outside testing hours, found a difference of two candles in a very short time. I have spoken about it privately to the officials of the company. I have not made an official communication to them on the subject. I report to my superior, therefore anything I said to the company would necessarily be confidential. I do not know enough of gas manufacture to tell whether such a thing is possible. I am an analytical chemist, and am supposed to understand the manufacture of gas to a certain extent.

Serjeant SARGOOD: Did it ever occur to you, when you discovered this rise of two candles, that they had been mixing the gas?

Witness: I cannot say I formed an opinion upon it. The fact occurred to

me, the explanation did not. I thought it sufficiently serious to take a step in the matter. I repeated what I had observed to one of the assistant engineers, and he remarked that the thing was impossible; that the testings they made at the works were generally 16 candles, and seldom under.

The CHAIRMAN: Did you, then, understand him to mean that it was impossible that there could be that rise, or that it was impossible because it was contrary to the tests they had made?

Witness: I understood him to mean it was impossible that there was such low illuminating power.

Serjeant SARGOOD: He must either have found that you were wrong, because he had a record giving another result, or that the thing was impossible; which did you understand him to mean?

Witness: I cannot tell you exactly what I understood him to mean. The probability is he thought I was in error.

Cross-examination continued: I know that the gas tested comes from the holders, which are capable of holding an enormous quantity of gas. Assuming one of them to be three parts full, I should say it would take a very long time to raise the quality of the gas two candles. The time would, of course, depend on the number of retorts in use. The quality of the gas could only be changed in the holders by sending in gas from the retorts of a different quality, or by leaving the retort-doors open.

The CHAIRMAN: Will you describe how that would have the effect you mention?

Witness: There is always a pressure against the inlet of the retort, on account of the exhausters which are used, and so air would get through the exhauster into the main by leaving the door of the retort open. Supposing that the door had been left open, and was shut, I can offer no opinion as to how quickly the quality of the gas would be raised.

Serjeant SARGOOD: You are now speaking of raising the quality of the gas; it must be done wilfully, must it not?

Witness: It may be from the negligence of the men, and may not be wilful on the part of the company?

Serjeant SARGOOD: Will you oblige by giving us all your figures that show the corrections for the barometer, and so forth, so that we may check your results? I want every one with respect to which you have thought it worth while to put upon the notes the result of your examinations, particularly those of the 12th and 19th of December. Have you all of them in that book?

Witness: No; I have the figures that corrected the illuminating power, but I have not the barometer and thermometer corrections.

Serjeant SARGOOD (the book having been handed to him): This book has entries at various intervals. I see here Saturday, 28th of November, and then various other dates; it looks like entries at weekly intervals. Do you use books for different days in the week—this does not appear to be a diary?

Witness: I was requested to make such tests as these, and thought it would be best to enter them all in one book as I made them. These are not official tests, and that is the only book I have been using in giving you the results.

Serjeant SARGOOD: You say you were asked to make those non-official tests. By whom, and when did you begin?

Witness: I was asked by Mr. Heisch. The date of the first is in the book.

Serjeant SARGOOD: The 28th of November, 1874; that was the time this bill was lodged. Now I follow you; it was then thought the time had come to get up a case. You must not offended if I ask you how much you have been paid extra for these non-official tests?

Witness: I have not yet been paid for them. I was told I should be paid for them.

Serjeant SARGOOD: What was the object of the entries in this book, beginning on the 28th of November?

Witness: To see what the gas was at Beckton, at other times than at the official testing times, was the object I had. I know nothing about the purpose. I was told to keep a record of it, and I did so. The records I kept were on slips of paper, and they have been copied into that book.

Serjeant SARGOOD: It looks to me as though it was all written at one time.

Witness: Many of the entries were written at the same time; the later ones were not. The originals are in my drawer at Beckton. I have not the slightest doubt they are copied correctly. I cannot be certain I have copied every one I ever took into that book. I do not think I have.

Serjeant SARGOOD: I think I can be certain you have not.

Witness: I have copied all taken since a certain date; before that I had pupils there, and tests have frequently been taken by me and other gentlemen, and of those I have no record.

Serjeant SARGOOD: As a matter of convenience, sometimes you cannot manage to attend at what I call office hours; by a little indulgence you can go in and make a test a little later, after office hours. If it happens that you are not able to get there at the time prescribed in the statute, is there any objection made to your going in and taking the tests as nearly as you can to that hour?

Witness: It may have happened that I could not take the three tests in the prescribed time; but I have been able to take two. Upon one occasion I think I took one only; that was on account of illness in my family. I think only once, during the whole time of my testing, have I ever omitted to take the tests during the three hours. Where I could not get the third within the time, instead of taking the two as an average I took a third afterwards. It was only on one occasion that I took only one in the proper time.

Serjeant SARGOOD: Is there anything in this book that will enable our people, who understand these things, to check your calculations?

Witness: If there is not everything I can give them what they require.

Serjeant SARGOOD: I want to draw one comparison; you have given on the 12th of December, at four o'clock, 14·88 as the uncorrected amount of the illuminating power. What would that be if you corrected it?

Witness: The correction is upon the average of that and the preceding test. We do not correct each figure before striking the average, but after we have a general average of uncorrected figures, because the variation during the three hours would be so slight in the barometer and thermometer as not to affect the test.

Serjeant SARGOOD: If I have followed you, you gave us on the 12th of December a certain illuminating power at 3.30 o'clock, and a certain illuminating power at 4 o'clock, and you said those figures, when corrected, gave a certain average. Did not you correct each of the figures?

Witness: I think I said the average of those figures, when corrected, gave a certain quality of gas.

Serjeant SARGOOD: No; you said the average of them, when corrected, would be 15 candles.

Witness: Yes, the average of the two tests. What I meant was that the average was corrected, not that the tests were corrected; it was the average of the two tests when corrected.

Serjeant SARGOOD: Supposing you had taken the four o'clock test—namely, 14·88—what would that come out when corrected, as near as you can tell me?

Witness: 15·2, I should say.

Serjeant SARGOOD: It is a very curious thing that we have a test at that very same hour, and our test is 16·01. Can you account why we should differ from you, seeing that you ought to be very careful about those testings? Do you think it possible?

Witness: Not with the same gas, if the experiment were made in the manner I made it.

Serjeant SARGOOD: On the same day, the 12th of December, at six o'clock, you got out a test which, when corrected, was 17·32. I think you said it took 10 minutes for the 10 observations, and, during that time, what was the greatest rise in the illuminating power which your experiments disclosed to you before you struck your average?

Witness: Not a candle and a half.

Serjeant SARGOOD: I am told that during that series of 10 experiments your figures show a difference of two candles in eight minutes, I want to know whether you think that a physical possibility, or the result of a blunder?

Witness: I think it is a physical possibility, because I have seen the flame alter in that time in the photometer. I do not know how it could possibly happen, but as a fact I mean to assert it.

Re-examined by Mr. PHILBRICK: I have been one of the examiners since the Act of 1868 came into force. Each test I have given to the committee has been taken in precisely the same manner. In applying the correction, we follow a certain prescribed rule of equality which the gas referees give us, varying according to certain conditions. They prescribe a division to be made by a figure founded upon the barometer pressure and the temperature. During the hours of testing, the company's illuminating power has never been deficient, except when an accident has occurred. Notwithstanding the suggestion that has been made that I was wrong in my tests, I have perfect confidence in them. Scientifically, I believe them to be accurate.

Mr. PHILBRICK: You have mentioned a period of eight minutes, during which a rise of illuminating power has taken place to the extent of two candles; is that a solitary instance in your experience, or have you known a rise about as rapid as that on more than one occasion?

Witness: On many occasions I have noticed it.

Mr. BIRLEY: As regards your system of testing, we understood the other day that it was very difficult to bring the test of gas to a perfect equation with candle-light, and yet you go minutely into decimals?

Witness: The decimals are the result of the equation, and not of observation. In the observation, we do not go beyond the first place of decimals; we do not go beyond tenths on the photometer, and that really means 2-10ths, because the light given by two candles is used. It is wrong to suppose that by merely multiplying the result by two you get the illuminating power stated in standard candles. It is not so; the light that is used is the light given by the amount of sperm burnt. The weather or the state of the atmosphere undoubtedly affects the result; but whether the weather was dull or clear would not, because the experiment is made in a closed instrument. I have similar results at all times of the year, and all times of the day.

Mr. BIRLEY: Has the eyesight of the person making the observation anything to do with the result?

Witness: It would not make any difference in the result, unless the eyesight were defective.

Mr. BIRLEY: Is your method of testing the same as that of the company?

Witness: The method of testing used by the company is, I think, similar in every respect to mine, with this exception, that they carry the candles some distance, and there is a chance of their spilling the sperm; that would mean so much sperm consumed. My candles are immediately under the photometer.

The CHAIRMAN: That would be to the advantage of the gas, would it not?

Witness: Yes.

Mr. BRASSEY: Do the corrections that you have to make of the average show a larger addition to the illuminating power of the gas in the daytime than they would in the evening?

Witness: That depends so much upon the temperature that I cannot answer. In the winter, the temperature in the daytime would be higher than at night; so the correction in the daytime would bring the lighting power up.

Mr. BRASSEY: It would be in favour of the gas?

Witness: The result would be the same in the end, because the correction is made to obviate the difference.

Mr. BIRLEY: Does a difference of pressure make any material difference in the illuminating power?

Witness: No; because the gas is burnt at the same pressure in each experiment, the pressure being regulated. Otherwise it would make a difference.

Mr. *Robert Hogarth Patterson*, examined by Mr. PHILBRICK.

I was one of the gas referees appointed by the Board of Trade on the passing of the Act of 1868. I ceased to act on Sept. 1, 1872. The standard burner in use when I was appointed was the Sugg-Letheby—the 1864—burner which gave two candles better result than the one used in 1860. I was one of those who selected the present test-burner, which gives two candles more than the 1864 one. As referees, we published two reports upon gas-burners and the proper principles for fully developing the illuminating power in any particular quality of gas. We spent some months in making a collection of burners from the trade. We also examined the burners in use in several large establishments in the City where much gas was used. A considerable number of those burners only gave about 25 per cent. of the light of the standard burner we adopted. On an average those burners gave about 60 per cent. only of the light that would have been obtained if the burner had shown a perfect result. The definition of the standard burner in the 1860 Act is of no use whatever, as it might be either as good as the present standard or very much worse. Indeed, the difference in light obtained from burners lies chiefly in the velocity at which the gas issues from the orifices. It is therefore important that the burner be made of a substance that does not become heated, otherwise the gas expands in passing through it, and that increases the velocity. In Sugg's burner that is to a great extent obviated by making the point of escape larger than the inlet. I consider the present standard burner is, for its purpose, as nearly a complete instrument as possible. I believe it has been considerably improved since its adoption. There is no meaning in fixing the price of gas without fixing the burner; one might as well fix the price of corn without saying whether it is to be measured by the Winchester bushel or another one. It is a commercial contract; science has nothing to do with it. It should be settled the same way as the standard pint, or bushel, or load of hay is. We submitted that opinion to the Board of Trade in a paper that has since been published. I think the standard burner is fit for general use by gas consumers, though it would not stand the draughts of a passage or corridor. It requires an ordinary apartment, where the atmosphere is quiet, no more. When there is much draught a flat-flamed burner, which gives a steady flame, should be used. The worse the burner, the less chance is there of its smoking. I have seen burners you could not make smoke, and these are the ones that give the worst light. As a test-burner, we adopted, and I still adhere to, the present prescribed burner. It has nothing to do with what the consumer may use. Its use ensures that a certain quality of article passes through the meters.

By the CHAIRMAN: There is not much difference between the present and the former burner as regards capability of use by the public. The present one is rather a fine instrument, but both are perfectly adequate for the public, though I would not recommend them for use by shopkeepers in open places. I consider that in prescribing the illuminating power and price the test-burner should also be fixed. It is not necessary for it to be the very best, but it is of importance that it should be a fixed burner.

Cross-examined by Sir E. BECKETT: As a question of useableness, there is not much difference between the 1864 and the 1868 burner, but as to illuminating power there are two candles difference in favour of the 1868 one. The burner of 1860 was of no use whatever. I have seen a 15-holed Argand burner giving a light of about 30 per cent. of what another similar one gave. I never heard of there being in 1860 burners in existence which gave as much light as the present ones. I do not know when Leoni's standard burner was invented—it was in existence in 1868. I do not remember seeing it before. I do not know who is to decide what burner is to be used for testing under the Act of 1860; my appointment only covered companies under the Acts of 1868-69. I had no occasion to test under the 1860 Act. When I was appointed referee in 1868 I was an author—

a writer upon science and general literature—and I had written upon the gas supply of London. I had no regular occupation in connexion with gas. Why I ceased to act was, that in April, 1872, we received a letter (there had been a change before) from the Board of Trade, stating that, in their opinion, we had all but exhausted the duties of gas referees; that it was necessary to reduce the expenses; and they reduced the salaries to less than one-third of what they had originally assigned to us. They also said that as the only difficult work remaining was to settle the sulphur maximum, they thought it advisable that the highest chemical science should be called in. The highest chemical and the highest physical science that has been called in (Professor Tyndall) has not moved the sulphur question one step from where we left it. The changes going on in the purity of gas at present, and which had begun in a remarkable manner before we left office, are, in my opinion, directly attributable to the investigations and processes devised and recommended by myself and my colleagues. There was a long correspondence between the Board of Trade and the Metropolitan Board, the corporation, and ourselves, and I think the letter above referred to was published in it as a parliamentary paper. I have frequently been consulted about gas matters, and have published a pamphlet on gas purification. About a fortnight ago, I was asked to give evidence on this bill. I have never managed or designed any gas-works, or had anything, practically, to do with gas-making.

Sir E. Beckett: The Metropolitan Board, and I think the City, wanted to have the appointment of one of those gas referees—competent and impartial persons, as they call them. Is there any idea of your being one of them?

Witness: Not that I am aware of.

By Mr. West: I have a patent for gas purification, taken out during the time I was a referee. The Board of Trade did not think that an improper thing. They wrote to me that they were satisfied with my procedure. My colleagues were Mr. Evans and Mr. Pearce; the former resigned in 1870, and Dr. Pole was appointed in his place, and he still continues one of the referees. The conditions of the appointment were that each referee could only be appointed for one year. I was appointed the first year, and was reappointed thrice, and, for the reasons assigned in the Board of Trade's letter to which I have referred, I ceased to be referee along with Mr. Pearce. Mr. Vernon Harcourt and Professor Tyndall succeeded us. The salary of each of these gentlemen was less than a third of what we had. During the time I was referee I had a full opportunity of seeing everything connected with the various gas-works. In March, 1872, my patent was taken out, and about a year after, when I found they were using it, I brought an action against the Chartered Company for its infringement. That action is now pending—I hope in its last stage. I have not got a verdict.

Re-examined by Mr. Cripps: The alteration in the Act of 1868, as to testing for the illuminating power, was that, instead of a burner being described in the Act, as in 1860, the referees who were for the first time appointed had to prescribe one. Before our time, the Sugg-Letheby burner was used, but we prescribed what is known as Sugg's "London" burner. It would be of no consequence to the consumer what burner is fixed as a standard, provided that the price is fixed along with it, so that he gets for a certain price gas tested in a certain way, and thereby of a certain quality.

(*To be continued.*)

FRIDAY, APRIL 30.

(*Before Mr.* A. W. Peel, *Chairman; Mr.* Randall Plunkett, *Mr.* Holms, *and Captain* Polhill-Turner.)

STOCKTON AND MIDDLESBROUGH WATER BILL.

(*Continued from page* 887.)

Mr. *J. C. Chaytor* was recalled, and cross-examined by Mr. Somerset.

He had once seen Dinsdale dam dry, but he could not say when it was. It was one Monday, and the river is always lower on that day, because the dams would be stopped on the Sunday. The fish had increased, but his complaint was that they had not increased sufficiently, in proportion to the trouble and pains taken. That was in consequence of the water being so low. There had been a good deal of poaching and poisoning, and in spite of that the fish had increased. He had himself killed seven in a day, and had rises from three more; but that was not good sport. A gentleman said he had killed 20 below Dinsdale. The sewage of which he complained came from Darlington, and he was glad to hear it was going to be stopped.

Re-examined by Mr. Paterson: It was within the last four years that he saw Dinsdale dam dry. He had seen it dry several times since the company's works were begun. Great pains, expense, and trouble had been taken by the Fishery Board to protect the fish, and that added to their numbers.

By the Committee: He sometimes killed fresh-run fish above the weir. The fish congregated in thousands below the dam, and any one could catch them there. He saw the dam dry in 1868, after the construction of the fish-lock. He could not remember having seen the river dry before the pumping station was made. He had fished from Hurworth to Gainford, and had never seen the river dry between Gainford and the pumping station, but he had seen it very low. They had been turning down young salmon since the Fishery Board was formed. In 1860 he gave evidence before the Fishery Commissioners, and then said that the fish had decreased in consequence of the Dinsdale fish-locks and the stake nets.

Mr. *Spencer Walpole*, one of Her Majesty's Inspectors of Salmon Fisheries, examined by Mr. Paterson, said he had several times visited the Tees. The estimated number of salmon caught there was given in his reports. In 1867 they estimated that 10,000 were caught by nets and 50,000 by rod and line. In 1873 they made a more accurate estimate, which showed 4712 salmon and 3400 trout; but they had no means of estimating those caught by rod. He had held an inquiry at Stockton, and found that one man's average for 15 years before the new Act was 47, and for 15 years after the passing of the Act it had increased to 72. In 1873 they found that there were 28 nets in public waters, and 22 in private waters, which had licences for taking salmon. The abstraction of more water from the Tees, by influencing the summer freshets, would injuriously affect the salmon. The more the freshets were reduced, the more the supply of fish in the upper waters would be lessened. That was where fish were almost entirely bred. The shallow water tended to encourage poaching; but he could not say that it would much affect spawning. If dry intervals often occurred in winter months it might be affected, but his experience was that there was plenty of water. The abstraction of water would hinder the operations of the Fishery Board, and diminish the interest of the upper proprietors, who wished to derive some advantage from the fish. He had, in 1869 or 1870, seen Dinsdale dam dry.

Cross-examined by Mr. Somerset: He had been down to the Tees nine or ten times. The Dinsdale dam was a great obstruction. An inquiry was about to be held to purchase Dinsdale dam by compulsion. The request was made by the Tees Conservators. Salmon ran up the Tees from about May, through the summer and autumn, and the number increased towards Christmas time. The salmon and sea trout caught in 1873 were 8112, weighing 47,760 lbs., and that was an increase over the take of the preceding year. That was the last report made. At Leeds the floods were impounded; but there was an arrangement that a certain quantity of water was to be given to the Wharfe during the dry seasons. A freshet in the Tees was about 200 million gallons, and that would be sufficient water for the salmon to go up.

Re-examined by Mr. Paterson: Every freshet operated on the instinct of the fish, and they moved up the river all the summer. He had visited some of the upper waters of the Tees, and some few only of the small tributaries would furnish spawning-beds. If storeage reservoirs gave out a portion of the freshets it would not interfere with the fish.

By the Committee: There were spawning-beds immediately below Barnard Castle, and he had no doubt the fish ran up some of the tributaries to spawn. There was an absolute obstruction 40 or 50 miles above the company's intake, which prevented the fish going further.

Mr. *Joseph Dodds*, M.P. for Stockton, examined by Mr. Bidder, said he had been acquainted with Stockton for the last 35 years. He was solicitor to the Tees Conservators, hon. secretary to the Fishery Board, clerk to the Stockton and Hartlepool Highway Board, clerk to the South Stockton Local Board, ex-Mayor and Alderman of Stockton, an ironmaster, a member of the Board of Guardians, and a burgess of Middlesbrough, so that he was interested in nearly every petition against this bill. The Tees Conservancy Commissioners were incorporated in 1852, having succeeded the Tees Navigation Company, which was incorporated in 1808 for cutting certain portions of land to straighten the bed of the river. The board represented the public, and had no private interest to serve. Large works had been executed to improve the bed of the river and the scour. A deep-water channel was being made from the sea upwards, by means of retaining walls, and by reclaiming land. Two breakwaters were being made at the mouth of the estuary, the south breakwater having been completed. They had expended between £300,000 and £400,000 on these works, and were seeking powers to borrow £300,000 more. For the removal of rock and dredging the river large sums had been expended, and some money had been expended above Stockton. At Stockton there was the lowest bridge on the Tees, and power was sought to remove it and erect a swing bridge. It was proposed to develop the navigation in the higher reaches; and, in fact, iron-works were springing up on the banks of the river above both bridges. The old "Roger Rock" was part of the basaltic dyke running across the island, and it had been blasted in two places where it passed through reaches of the river. The abstraction of large quantities of fresh water must diminish the scouring power of the stream, and render more dredging necessary. It would also cause a foulness in the river, so that the Tees would be in the condition that the Thames was a few years ago. If the population and works continued to increase, the company must, in a very short time, take double the quantity of water, if there was double the quantity to take, which he doubted. He should put the flow at a very much smaller quantity than Mr. Hawksley had. The witness then gave instances in which he had observed that the quantity of water in the river had diminished of late years, since the operations of the company commenced. He had seen Dinsdale weir very low, and had walked over the crest of the dam when there was no water whatever flowing over it. Between the pumping station and Dinsdale dam were two very considerable tributaries, one being the Skerne, which brought the Darlington sewage, and the other Clow beck, which ran into the Tees from the south side. Those tributaries drained about 100 square miles, he believed. The abstraction of the water proposed would be most seriously prejudicial to the interests of the people at the lower parts of the river. The ironmasters of Stockton and Middlesbrough agreed in that view, and he had not heard any one in Stockton, except Dr. Farquharson, say he was in favour of the bill. Indeed, its supporters appeared to be confined to the officials of the company. He knew the Weardale watershed well, and the system of storing the impounded waters. He had expressed to the officials and directors of the company that that was the best system for the Tees. If there was one district in the world better adapted for such a system than another, it was the Tees. Whatever might be the extra cost, the people of Tees-side were as able to pay the necessary charges as were the people of Weardale. There were many tributaries that might be utilized without touching the lead mine streams, and at less than half the distance of 70 miles, as suggested by Mr. Hawksley. The Lune was a large stream, with water in its tributaries sufficient to supply the whole district. It was entirely unpolluted, and offered splendid opportunities for forming storeage reservoirs. The Balder was also a beautiful stream; and one of the finest streams imaginable for that purpose was the river Greta, which discharged into the Tees at Rokeby. It had a large watershed, and was totally unpolluted. Then on the other side of the river was Staindrop beck, another stream which might be taken, and which had a watershed sufficient to supply the whole district. Each and all of those watersheds would lend themselves to storeage purposes, and they would not require a great extension of mains or a heavy cost. If this were done the flow of the Tees would be preserved, and neither the conservancy nor the riparian owners would then be prejudiced. When the company first began to supply Darlington, the quantity of water taken was so insignificant that no opposition was offered; but each time they had come to Parliament since it had been more necessary to oppose them. The interference with the river bed, by laying the pipes, was of great concern to the conservators. In 1865 the company applied for permission to lay a line of pipes under the bed of the river, and the conservators agreed, with a proviso that if the bed of the river should be altered by the commissioners, by dredging or scouring, the company should relay their pipes at a lower depth. If fresh pipes were to be laid, there should be a similar proviso. The grant was subsequently abandoned, and an aqueduct substituted. It was not correct to say that all the water used at Middlesbrough and Stockton was returned into the river, as a large quantity was evaporated at the iron-works. Besides, what did return was too low down to be of any use for scouring purposes. At Stockton Forge he paid more than 7d. per 1000 gallons for the water. He had been connected with the Fishery Board from its formation. They received about £400 a year from licences, which was spent in watching, prosecuting offenders, &c. The labours of the board had been attended with some considerable degree of success, but there was a great deal more to be done. Dinsdale dam must be got rid of, and the abstraction of the water prevented. The lowness of the river was partly due to the increased land drainage, which made the water flow off more rapidly. In the session of 1864 the conservators petitioned that some limit should be put to the quantity of water to be taken from the river, and the limitation clause was inserted. In the Aberdeen Act the limit was six million gallons per day, and there were clauses as to gauges and inspection, which, it was urged, should be put in the present bill. The low water in the Tees was conducive to poaching. The laying of the pipes along the highway would throw a considerable additional expense on the Road Trustees. It would also cause considerable inconvenience in some places, such as Thornaby, where, if some of the narrow roads were stopped, it would be impossible to go by another way. It was quite possible to take the pipes across the country without touching the roads, as was done near Darlington, and also near Fighting Cocks reservoir.

Cross-examined by Mr. Somerset: There was nothing in the bill to protect the Road Trustees other than was afforded by the general Act, which, in his opinion, was insufficient for that purpose. Restrictions were imposed under the Liverpool Act of 1862, but he would not be satisfied with those, as the company ought to be prohibited from passing along the streets of South Stockton, as they had avoided passing through the streets of Darlington, where their shareholders lived. There was also a hardship in the road authorities having to keep up the roads if a subsidence took place through the company's contractor scamping his work. He did not see why the corporation should be bound to maintain the roads which had been broken up by the company for their own profit; and, if the Water-Works Clauses Act were again before Parliament, he did not think powers would be given as they had been. The company ought to have a superintendent of their own to look after works undertaken for their own profit, instead of taking up the time of the district surveyor without compensation. Clause 6 of this bill gave powers beyond the general Act, as it allowed the company to stop up private roads, and to appropriate the sites of roads so stopped up, if they interfered with the execution of their proposed works. That might not so much affect the

Highway Board as the South Stockton Local Board. The sole real obstruction on the Tees was the Dinsdale dam; but that was not the only secret of the fishing not improving as it should do. He did not know what the cost of reservoirs would be for storing the impounded waters and supplying the district. He considered it absolutely necessary that the iron-works should have a good supply of water. He had no complaint to make respecting the quality of the water. He did not agree with Mr. Hawksley that the water company had made the district. The ironmasters had been ready to supply themselves for 2d. per 1000 gallons, when the clause for 3d. per 1000 gallons was inserted in the former Act. He did not know whether there was a lower charge than that anywhere; but he thought the ironmasters would be willing to pay whatever was fair to secure a good supply, without taking more from the river. He had given evidence for the company against the proposed drainage of Gainford into the Tees, and said the population of the district was dependent on the Tees for water. He was still of that opinion, but he did not say they were dependent upon the supply from Tees Cottage. He then said that the water was as pure as river water could be, and he still thought so. If they could avoid putting lead washing and sewage into it, it would be still better. The supply would be better from a source above those pollutions. There was a considerable area about the Lune, which was entirely free from lead mines. There was no foundation for the statement that he was the opponent of the bill, but he thought it was to be regretted that an alternative scheme was not brought before the committee. He was not the author of the opposition, and could not say why the district had not been examined for another source of supply. It would be some years before the Darlington drainage could be diverted, although Darlington had been considering schemes for some years. They were not considering schemes at Stockton, because they had a very good system of drainage into the Tees. It might become necessary to alter that system, but they had not yet seen the necessity for it. He did not say it was a good system. In the Tees Conservancy Bill, the proposal to subscribe £5000 towards altering the Tyne Bridge had been withdrawn. He did not believe that more water would be required at Middlesbrough and Stockton for trade and domestic purposes.

MONDAY, MAY 3.

The committee acceded to a request from Mr. BIDDER that the cross-examination of Mr. Dodds might be postponed, owing to his absence in the North upon business.

Mr. *Frederick A. Milbank*, M.P. for the North Riding of Yorkshire, examined by Mr. BIDDER, said he had a residence on the Lune, which river would afford an abundant supply of water for the district supplied by the promoters. He also knew the river Balder, which drained a very large area, and enormous quantities of water came down in floods. He knew many other large streams about Barnard Castle and Gainford, any of which would afford a sufficient supply of water for making reservoirs. He himself had made one a mile and a half round and 40 feet deep, and there was a continual supply of good water. The country lent itself to the formation of reservoirs. The water was of the finest quality and in any quantity.

Cross-examined by Mr. LUCK: He never saw the Lune out of flood in the dry season of 1874. It was never dry, but always running. The whole of the streams he had mentioned came from springs. He had had no experience as an engineer; but he engineered his own reservoir, and the dam had not moved in the least degree. He could not say what size reservoirs would be required to supply Stockton and Middlesbrough, but as many as they liked could be made by damming up the valley. It would not affect the navigation of the river at Stockton and Middlesbrough if they kept back those large quantities of water.

Mr. ASPINALL then addressed the committee on behalf of the Highway Board of Stockton and Hartlepool, the trustees of the Stockton and Middlesbrough turnpike road, and the South Stockton Local Authority. He objected to the interference with the roads which would be made by the proposed line of pipes; and denied that there was any proper provision in the general Act with reference to this matter. In 1847, when the Water-Works Clauses Act was passed, water-works were not in the condition that they were at present. The power was originally given to metropolitan companies, but was afterwards extended to the various companies having parliamentary powers, so that they might lay their pipes along public roads, instead of purchasing way-leases from private parties. In the present instance the promoters were going to lay their pipes along 20 miles of country roads, where there were few houses requiring the supply of water; and if they did require it they could equally well have it from the pipes laid on private lands. Such a state of things was never contemplated when the Act was passed, and its very language showed that what was contemplated was the interference with the streets or alleys of the towns or villages which were supplied by a company. Then the road officers had to superintend the relaying of the roads, without being paid for it by the company. It was a question whether a surveyor would undertake that extra work without payment. Even though the company had to pay a small sum for way-lease to private parties, was that a reason for inflicting cost, damage, and inconvenience upon the public? It could never have been contemplated that companies were thus to be relieved at the expense of the public.

Mr. STEPHENS addressed the committee on behalf of the Middlesbrough Corporation, saying that the town being situated lowest on the river they required the larger quantity of the fresh water which the promoters proposed to take, so that the sewage of the towns above might be drifted past their borders. The chorus of condemnation of the company has not arisen from any financial failure; for their rent was £40,000 a year, and their dividends were always paid, but it was admitted by some of the promoters witnesses that the pressure of the water was small, and the quality sometimes not over good. It could not then be an efficient company, and if they might say their shortcomings were exceptional, they were however sufficient to raise the opposition which was shown. An objection was also raised to the sliding scale and to the charges of the corporation. The meters for the latter were taken at different points, and thus the corporation had to pay on the higher scale for the different meters, while other large consumers had the advantage given of low rates for their total consumption. This showed that there was a wrong system of charges. Then the rate of filtration was found to be too rapid and the area of the filter beds insufficient. A standard of purity had been almost laughed at; but if there was one thing more than another essential to life in which the greatest purity was desirable, it was water. The charges for meters, and the restriction of plumbing operations in connexion therewith to the company's own workmen, were also complained of. The first proposal of the bill was to add £300,000 to the present capital, and to have £75,000 additional borrowing powers. That would be practically doubling the capital. The bill was not only to improve the supply, but to extend the area by taking in large districts. It would thus strengthen its grasp on the public. With such a comprehensive bill the promoters should have shown that their reservoirs were sufficient, that the water was free from pollution, and that they had looked elsewhere for a better supply in vain. Instead of that, they proposed to inconvenience the public at the smallest possible cost to themselves. The promoters said there was an insufficient and inadequate use of the supply; but in the face of that they proposed to supply new districts. The limit of 60,000,000 gallons per week, imposed in 1864, compelled the company to come to Parliament, as it was probably intended that the manufacturers were to be supplied only so far as the pumping would not affect the river; but that as soon as the limit was reached, they must go elsewhere for a further supply. The learned counsel then went through the evidence on this point, and asked, if the corporation came with a competing scheme, where would this question of limit be? The Middlesbrough Corporation had been ready to show an alternative scheme, but the promoters would not allow them to do so, as they objected to it being brought forward in anything like detail. And if this bill passed, Middlesbrough and the company itself would be tied to this polluted water supply. The chairman of the company himself said that they would be better without the bill. No harm, but every possible good, therefore, would be done by rejecting the bill.

Mr. *John T. Belk*, town-clerk of Middlesbrough, examined by Mr. BROWNE, said not only was the council unanimously in favour of opposing the bill, but a public meeting of the ratepayers was also opposed to it. The feeling of the district he believed to be very strongly against the source of the water supply. They thought it should be taken from the hilly districts above the source of pollution. He agreed with the views of Mr. Dodds and Mr. Milbank as to that supply. The company did not properly filter the water, which was highly coloured; but the house filtration generally removed both the colour and the floating particles. The corporation complained very much of the rates charged. The corporation last year paid £90 for public meters alone. They were not allowed to buy their own meters, or to have their own plumbers to the pipes. If they were allowed to do so it would be cheaper for the corporation. If they were charged in bulk they would have to pay on the lower scale of 3d. per 1000 gallons, which the North-Eastern Railway Company were charged, while the corporation had to pay 6d. per 1000 gallons. The pressure in case of fire was very low; and the water was often entirely off without notice. That was dangerous to life, as the sudden turning on of the water was likely to produce explosions in domestic boilers.

Cross-examined by Mr. SOMERSET: Middlesbrough desired to obtain a water supply for itself, as it was thought the works ought to be in the hands of the corporation. If this bill passed, Middlesbrough would be precluded from doing that; but that was not the sole reason of the opposition. If the Corporations of Stockton and Middlesbrough purchased the company's works, they would use them for trade purposes, and make storeage reservoirs for domestic purposes.

Mr. *Edward Williams*, ex-Mayor of Middlesbrough, and chairman of the Sanitary Committee, examined by Mr. STEPHENS, said he was connected with the firm of Messrs. Bolckow, Vaughan, and Co., which used the water of the company solely for boiler purposes. For all other purposes they pumped the water from the river. He thought the domestic supply ought to be got from above the sewage contamination of the towns above Tees Cottage. Public opinion on that point was very strong in Middlesbrough.

Dr. *Frankland*, F.R.S., D.C.L., professor of chemistry in the Royal School of Mines, and one of the Royal Commissioners appointed to inquire into the pollution of rivers, examined by Mr. BROWNE, said he had made an analysis of the water pumped from the Tees at Tees Cottage in 1870, and also some pumped by the Darlington Company, which takes its supply from the same source, nearly on the opposite side of the river. There was some organic matter, but no sewage, in the latter, while the former was better, and unimpeachable as water. This year, on March 9th, he examined a sample of water from the pumping station, and found it very foul and unfit for domestic purposes, even after filtration. [Witness handed in a table of the results of his analyses.] It was a matter of absolute demonstration that the sewage matter of Barnard Castle found its way down to the pumping station. He believed that the germs of disease were disseminated by water, and water which contained the fæcal matter from cholera and fever patients would carry that disease, although chemical analysis failed to detect it. The flow down a river, however tumultuous, would certainly not have a tendency to remove these germs, nor would filtration.

Cross-examined by Mr. SOMERSET. He did not find any injurious matter in the water taken in 1870, which, as far as chemical analysis went, was of unimpeachable quality. In the analyzed sample of 1875 there was a good deal of peaty matter and some animal matter of sewage origin. That water was not submitted as a sample of that supplied by the company, as it was taken before filtration. He knew, from experience, what filtration could do with water of that character, and could say that no filtration possible for a water company to carry out would make that water potable. Sewage would require to flow probably 200 miles, at the rate of a mile an hour, before it was oxydized so as to become innocuous. In dry weather river water was much better than in time of flood, and it was a great defect in the system of this company that they had no storeage reservoirs, so that they could avoid the highest floods. As it was they had to take water day by day, in order to keep up their supply. In time of flood the accumulated excrement of the population would be suddenly washed down the stream, contributing in a very great degree to pollution. Besides peaty matter from the moors was also brought down in increased quantities. On an average, he would say the Tees was better than the Thames water, which was taken for the supply of London at Hampton, above which town there was a larger and denser population than was situated on the Tees above the company's intake.

Re-examined by Mr. STEPHENS: Ordinary healthy sewage might be drunk with impunity when mixed with water, and was so drunk by a large portion of this country; but the moment the sewage became infected by the poison of typhoid fever or cholera, then those drinking it would suffer fearfully. Analysis would fail to detect that danger.

By the COMMITTEE: Peaty matter in the water would not, strictly speaking, be injurious to life, but was liable to produce diarrhœa. There were very few waters, except spring waters, which did not contain some peaty matter. Oxidation went on very nearly as well in storeage reservoirs as in flowing water, if the reservoirs were only moderately deep. The peculiar matter prevalent in the excrement of cholera patients would pass through any filter.

Dr. *Alfred Hill*, examined by Mr. STEPHENS, said he was professor of chemistry and toxicology at Queen's College, Birmingham, medical officer of health for the borough, and public analyst for the county of Warwick. He had seen Dr. Frankland's analysis, and quite agreed with it, that organic matter was exceptionally high in the water from Tees Cottage. It was a supply which, for domestic purposes, should be done away with as soon as possible, as, though it might not be fraught with danger in ordinary times, there was no doubt it would be in the case of the existence of zymotic, particularly of diarrhœal diseases. The very high death-rate of Birmingham was, he believed, largely due to the impure surface well waters which were consumed, and also to the impurities contained in the portion of the water supply derived from rivers. On analysis a chemist could not discover that organic impurities in any water were disease germs. Filtration would remove suspended particles of some kind, but it did not remove all. According to the experiments of certain physiologists, these injurious particles, being so minute, passed through the pores of any filter. He considered the fresh supply of the company for domestic purposes should be obtained from a higher level, far removed from any pollution. Having regard to the character of the Tees, he thought it a very unwise proposal to do away with the restriction as to the maximum quantity of water to be taken from that source.

Cross-examined by Mr. SOMERSET: He had not himself analyzed the Tees water, but had heard Dr. Frankland's results, and the evidence he had given was derived simply from these statements. Water was not the only cause of a high death-rate, though bad water perfected the development of diarrhœal diseases.

(To be continued.)

Miscellaneous News.

METROPOLIS GAS SUPPLY.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in Marylebone during May:—

1875.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 24 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Comp.'s gas	16·25	17·34	15·21	24·60	9·66	25·10	0·79	No trace
Chartered Comp.'s common gas	16·03	16·61	15·00	32·47	14·50	11·39	0·86	No trace
Chartered Comp.'s cannel gas	20·63	21·50	19·24	19·63	10·72	15·40	0·74	No trace

Mean of daily readings of barometer . . . . 29·81
" " " thermometer . . . 67·49

* Each observation consists of ten readings of the photometer, at intervals of one minute.

During the month the mean illuminating power of the Imperial Company's gas was equal to the light of 16¼ candles; it ranged between 15·21 and 17·34 candles. The present legal standard of this gas being 14 candles, it will be seen that it was never less than a candle and a quarter, as regards the intensity of its light, in excess of what the law requires. The mean quantity of sulphur found in 100 cubic feet of this gas was 25·10 grains; tested on the 14th and 15th of May, 34·55 grains of sulphur were found, and on the 26th and 27th of May it amounted to 26·44 grains. Having regard to the fact that the quantity of sulphur allowed by law is only 20 grains in 100 cubic feet, the excess above referred to requires explanation. The quantity of ammonia found was 0·79 of a grain. The mean light of the Chartered common gas was equal to 16 sperm candles (the legal standard); it ranged between 15 and 16·61 candles. The mean quantity of sulphur found was 11·39 grains, and of ammonia 0·86 of a grain. The mean light of the Chartered cannel gas was equal to 20·63 candles; it ranged between 19·24 and 21·50 candles; seven times it exceeded 21 candles and twice only was it below the legal standard of 20 candles. The mean amount of sulphur found was 15·40 grains, and of ammonia 0·74 of a grain. The pressure of all the gases was satisfactory, and on no occasion was sulphuretted hydrogen detected in either of them by the ordinary tests. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the Chartered Company's gas manufactured at their works, Beckton and Bow.

Dr. Stevenson's report on the gas supplied by the Imperial Company to the vestry of St. Pancras, during the month of May, 1875:—Maximum light, estimated by sperm candles, according to the Act—14·90. Minimum light, sperm candles—14·0. Average light, sperm candles—14·3. Traces of ammonia, indicated by turmeric test-paper—traces on every occasions. Traces of sulphuretted hydrogen, indicated by lead test-paper—none. Sulphur, 13·2 grains per 100 cubic feet.

METROPOLIS WATER SUPPLY.

Dr. Whitmore's report on the composition of the Thames companies and other waters supplied in Marylebone during May:—

1875.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by incineration of Solid Matter in previous column.		Hardness before boiling, in degrees.	Hardness after boiling, in degrees.
	May, 1874.	May, 1875.	May, 1874.	May, 1875.		
Distilled Water	0°	0°	0°	0°	0°	0°
West Middlesex water	18·40	19·12	0·88	0·80	12·04	2·84
Grand Junction water	19·32	17·44	1·60	0·96	12·64	2·68

* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water.

During the month the water supplied by the West Middlesex Company maintained its high character for brightness, clearness, and efficient filtration, that of the Grand Junction Company was also generally clear and free from turbidity. No living organisms were detected in either of them.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London water companies during the month of May, 1875. According to their returns, 121,543,526 gallons, or 552,228 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 234·9 gallons (106·7 decalitres), rather more than a *ton* by weight, to each house, and 33·1 gallons (15·0 decalitres) to each person, against 33·5 gallons during May, 1874. According to returns of the London water companies made to the select committee on East London Water Bills (session 1867), it is estimated that, during the year 1866, about 82 per cent. of the total supply of water for all purposes was for domestic use. Applying this proportion to the total quantity supplied daily in the month of May, 1875, it may be estimated that about 99,665,691 gallons were used for domestic purposes, or about 27·1 gallons per day for each inhabitant, against 27·5 in the corresponding month of last year.

Companies.	Number of Houses, &c., supplied in May, 1874.	Number of Houses, &c., supplied in May, 1875.	Aver. Daily Supply of Water in Gallons* during May, 1874.	Aver. Daily Supply of Water in Gallons* during May, 1875.
Total supply	510,033	517,489	121,281,839	121,543,526
From Thames	239,673	243,246	63,076,863	61,836,477
„ Lea and other Sources	270,360	274,243	58,204,976	59,707,049
THAMES.				
Chelsea	28,395	28,555	8,648,000	8,004,500
West Middlesex	45,754	46,738	10,062,205	10,484,239
Southwark and Vauxhall	79,638	80,026	18,850,300	18,650,000
Grand Junction	35,144	35,709	12,135,958	11,632,738
Lambeth	30,742	32,218	13,380,400	13,065,000
LEA AND OTHER SOURCES.				
New River	122,121	123,193	28,584,000	28,964,000
East London	105,562	107,294	22,493,200	23,644,000
Kent	42,677	43,756	7,127,776	7,099,049

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for May, 1875, as compared with that for the corresponding month of 1874, shows an increase of 7456 houses, and of 261,687 gallons of water supplied daily.

Dr. Frankland, F.R.S., reports that the proportion of dissolved organic impurity in the river waters supplied to the metropolis during May was larger than in April, but the samples drawn from the companies mains all showed the results of efficient filtration. The Kent Company's water, derived from deep wells in the chalk, "maintained its usual good qualities." Taking unity to represent the amount of organic impurity in a given volume of the Kent Company's water, the proportional amount in an equal volume of water supplied by each of the other metropolitan companies was—New River, 1·4; West Middlesex, 2·1; Grand Junction, 2·4; East London, 2·4; Chelsea, 2·5; Southwark, 2·7; and Lambeth, 2·7.

Major Bolton's report for May states that throughout the month the condition of the water in the river Thames at Hampton, Molesey, and Sunbury, where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, and East London Companies are situated, was very good. The highest flood state of the river at Hampton during the month was 5 inches above the (6 feet) summer level, and the lowest 1 inch below. At Seething Wells, Kingston, the state of the water in the river was good on 25 and indifferent on 6 days. The highest state of the flood water at this place was 9 inches, and the lowest 1 inch, above summer level. The highest temperature of the water during the month was 67°, and the lowest 57°, while the highest temperature of the air at the same place was 77°, and the lowest 53°. These observations were made daily at nine a.m. The rainfall during the month was 1·09 inches. The Lambeth Company have completed and put in operation the new 24-inch main from Brixton to Newington, and additional large pumping mains are being laid from the new engines at Brixton to pump to the new reservoir to be made at Norwood, for which the land has been purchased.

BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from page* 89.)

The Annual Dinner of the Members took place on Wednesday evening, the 9th inst., at the Queen's Hotel, Wellington Street, when about 150 persons were present. After the usual loyal toasts from the chair, "The Army, Navy, and Reserve Forces" was responded to by Captain Skelton. The toast of the evening, "Success to the British Association of Gas Managers," coupled with the name of the President, was proposed by Mr. Spice in his usually happy manner, and was received with loud acclamations. "The Vice-Presidents" were proposed by the president, and responded to by Mr. Foulis. "The Visitors," coupled with Mr. A. Vernon Harcourt, was proposed by Mr. Hartley in suitable terms, and replied to, of course, by Mr. Harcourt. The secretary's health was drunk on the proposal of Mr. Douglas, who made one of the most humorous and telling speeches of the evening, causing roars of laughter. The secretary replied appropriately. "The North British Association" was proposed and responded to by Mr. Hislop and Mr. Fraser. "The Manchester District Association" was responded to by Mr. Hunter; and "Prosperity to the Town of Leeds," coupled with the name of Mr. Woodall, was proposed by Mr. Magnus Ohren, and responded to by Mr. Woodall.

Excursion to Ripon and Studley Royal.

The meetings of the British Association of Gas Managers, held in Leeds, were brought to a close on the 10th inst. by an excursion which had been generously provided by the "Yorkshire friends" of the association. Some time ago several of the managers of the Yorkshire gas-works constituted themselves into a committee to make the necessary arrangements, so as to give the members, during their visit in Leeds, a "Yorkshire welcome." The co-operation of numerous friends enabled the Reception Committee to carry out the excursion in such a manner that gave the greatest satisfaction to all who availed themselves of the opportunity of visiting one of the most beautiful spots in the United Kingdom.

A special train conveyed the members, with their wives and friends (to the number of about 320), to Ripon, and on their arrival at the station, carriages were in attendance to convey them to Studley Royal, the seat of the Most Noble the Marquis of Ripon. The distance from the station to Studley Royal is a little over three miles, and the drive is through a most charming country. The carriages were "well horsed," and the excursionists were taken the distance at a rattling pace.

Within the grounds of Studley are the remains of Fountains Abbey, which are the most beautiful, as well as the most extensive, of any of the monastic ruins in the United Kingdom. The abbey was founded in the twelfth century, and, as it has been built at various dates, it embraces various styles of architecture, commencing with the Norman and extending to the rectilinear orders. The grounds of Studley Royal are kept in beautiful order, and abound with charming views of varying character. The company mustered at the gates, and then proceeded to ramble over the grounds and about the abbey.

At 1.30 an adjournment took place to the marquee, where a capital luncheon was provided, Mr. Blacker, of the Crown Hotel, being the caterer. Spencer's quadrille band of fifteen performers played several classical selections during the repast. Our old friend, Mr. Broadhead, of Great Grimsby, presided at the feast in his usual exuberant and hearty manner, and was supported in the vice-chair by Mr. Craven, of Dewsbury. The usual loyal toasts were given by the chairman, and were most loyally received by the assembled guests. The following toasts were also given, and were most heartily received:—"The British Association of Gas Managers," proposed by Mr. Magnus Ohren, and responded to by the president of the association, Mr. James Paterson, of Warrington. "Our Yorkshire Friends," proposed by Mr. Jones, of Dover, and acknowledged by Mr. Craven, of Dewsbury. "The Reception Committee," proposed by Mr. Bennett, of London, and responded to by Mr. Burgess, of Huddersfield. "Thanks to the Most Noble the Marquis of Ripon for his kindness," was given by Mr. Paterson, and most heartily responded to with musical honours by the band and all assembled. "The Ladies," proposed by Mr. Thornes, and the response by Mr. Walter Hutchinson, of Barnsley. "The Health of Mr. Jowett, the honorary secretary," was proposed by Mr. Broadhead, and enthusiastically received.

The guests now adjourned, and formed themselves into a group, in which position several negatives were taken by the photographer. Dancing then commenced on the sward, and several trials of the fleetness of some of our friends took place. Unfortunately the weather, which up to this point had been most favourable, now began to break, and rain came down very fast. The tables in the marquee were cleared away, and the band stationed inside, when dancing was kept up with great spirit during the remainder of the stay at Studley.

The carriages conveyed the party back to Ripon, where the ladies were provided with tea at the Crown Hotel. The guests were then conveyed to the station, and the train left punctually at seven p.m., the appointed hour, arriving at Leeds about eight p.m.

Thus ended one of the most enjoyable of all the association's excursions. Every one seemed delighted with the Reception Committee's arrangements. The scene at the abbey and at the dance, being graced by the presence of a much larger number of ladies than had been at any of the prior excursions, was indeed quite brilliant, and every one seemed happy and desirous to promote the enjoyment of all concerned.

Tuesday, June 8.

At the afternoon sitting, Mr. G. Livesey read the following paper on

HILLS'S LIQUOR PROCESS FOR PURIFYING GAS.

In the early days of gas lighting, the question of purification appeared a very simple matter. Sulphuretted hydrogen was regarded as the chief, if not the

only noxious ingredient to get rid of; and lime was found to be a very effective agent for its removal. Carbonic acid was disregarded, and beyond what the old-fashioned washer accomplished, no attempt was made to purify from ammonia; while, happily for the managers of those days, the chemists had not discovered what they call the "sulphur compounds." Even to this day they are not prepared to tell us in what form the small quantity of sulphur—about the one-thousandth part of the weight of the gas—remaining after the sulphuretted hydrogen has been abstracted, exists, whether as bisulphide of carbon, or as a sulphocyanide, or in some other unknown state. However, they have discovered a certain proportion of sulphur in purified gas, and succeeded for a time in persuading the consumers that it was the cause of great injury to their furniture, their goods, and themselves.

Happily common sense was not quite extinguished, and a more reasonable view is now prevailing; for it is argued by some of those who made the greatest outcry against sulphur, that it is a decided advantage *not* to remove the whole. It is, in fact, generally conceded that, whatever objection might be made against 30 or 35 grains in 100 feet, there is no necessity to find fault with about 20 grains. I ought to add that we are mainly indebted to one or two eminent chemists for this change in popular feeling, who have manfully resisted the panic that at one time appeared imminent on this question of sulphur in gas. Lime, however, not only removed sulphuretted hydrogen—the purpose for which it was primarily used—but it at the same time took up the carbonic acid, and a certain proportion of those sulphur compounds whose very existence was then unknown. As the manufacture of gas extended, the use of lime as a purifying agent became an intolerable nuisance, poisoning the air of the neighbourhood of the gas-works, and causing a very strong antipathy to their existence in proximity to houses or any public resort—an antipathy which, with the nuisance abated, is still in full force in almost all parts of the kingdom. It is but fair to add that the stench from the refuse lime 30 years ago was much greater than it need have been, owing to the presence of a large quantity of ammonia, which, instead of being removed from the gas, was simply neglected, to the detriment of the gas, the loss of the gas companies, and the great injury of all brass-work in the gas-fittings and meters. But, with ammonia entirely removed, and waste lime, to a considerable extent, deprived of its power to create a nuisance, the enormous development of gas-making renders its use exceedingly objectionable. The purifiers are required of very large area, to diminish, to some extent, the pressure caused by lime; while to get rid of it, after it has done its work, is in London not only a very expensive but a very difficult matter.

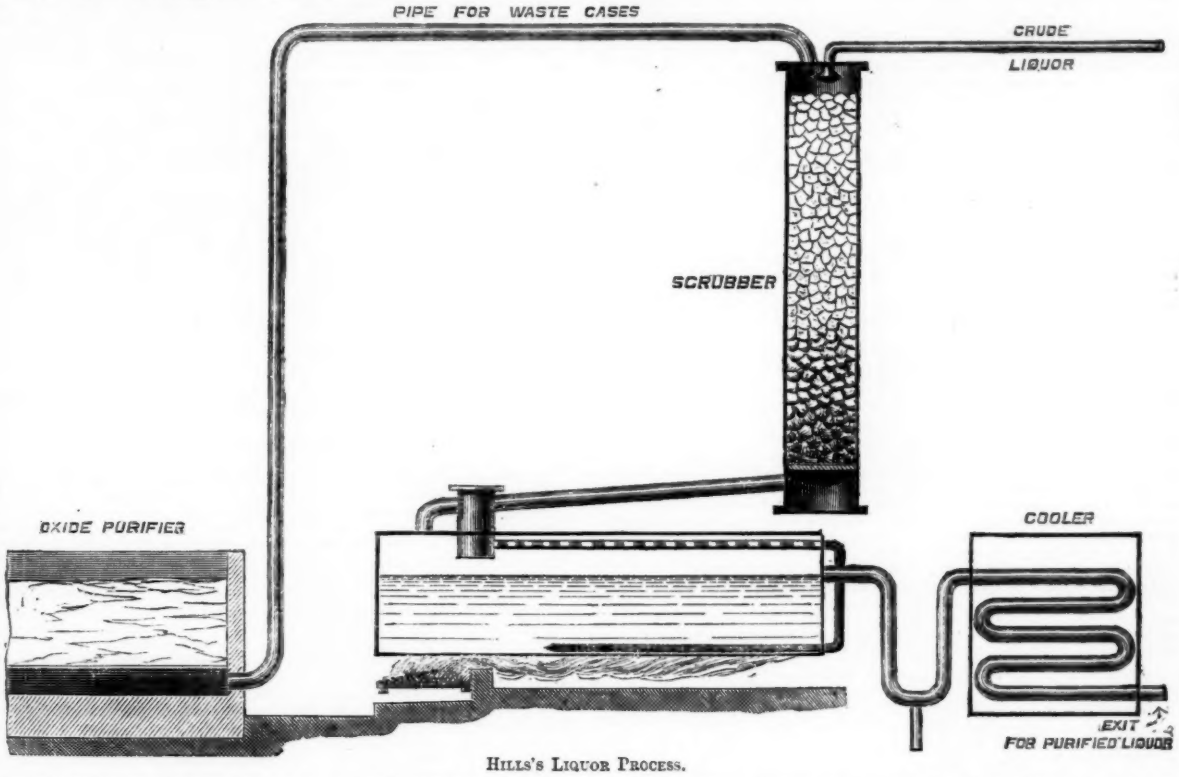
Had we to deal only with sulphuretted hydrogen, nothing whatever has been discovered that can compare with oxide of iron, which is wonderfully effective, easy to work, gives little pressure, is very cheap, and causes no nuisance; but seeing that it does not touch sulphur in other forms or carbonic acid, we are driven to the use of lime or some other alkali. But for the necessity to deal in some way with the sulphur compounds, oxide would be the universal purifier, the objection to carbonic acid not being sufficient to make its abstraction necessary.

It has long been well known that caustic ammonia might be substituted for lime, but the difficulty has been to obtain and use it, the ammoniacal liquor being a combined carbonate and sulphide. The ammonia in crude gas not existing in nearly sufficient quantity to neutralize the other impurities, attempts have been made—first by Mr. Laming, about the year 1860—to desulphurize the liquor, which he effected by passing it through oxide of iron, the result being that the liquor so treated completely removed the remaining sulphuretted hydrogen from the gas; but this plan was considerably more costly than the direct use of oxide of iron. Then Mr. Hathaway and the writer succeeded in depriving the whole of the liquor made at the South Metropolitan works of its sulphuretted hydrogen by passing it through a common coke scrubber, through which the waste gases from the retort furnaces—cooled, of course—were driven. The great excess of carbonic acid drove off the sulphuretted hydrogen, and then, strange to say, this carbonate of ammonia liquor, in which the SH had been displaced by CO_2, was found to be a most effective agent for absorbing SH from the gas, and for months during the year 1867 the whole of the gas made was purified in this way. The carbonic acid and the sulphur compounds were simply ignored, the relation of these impurities to each other being at that time unknown. Had our chemical knowledge been more perfect, we should have scouted the idea of trying such an experiment; but having tried it on a small scale, and found it effective, we went on and proved its possibility, but to this day I cannot understand it. The plan, however, did not pay. Oxide again was triumphant, owing partly to a small loss of ammonia, which was the case with Mr. Laming's system.

About the year 1869 Mr. Hills came into the field with another plan for depriving the crude gas liquor not only of SH, but also of CO_2, thus producing a rough caustic ammonia, which he accomplished by violating all chemical theories; and to such an extent was this the case, that almost every chemist to whom I have explained the process has said, "I could not have believed it unless I had seen it," and one very eminent man said he did not believe it when he had seen it, but told me when I showed him the liquor and explained the process, that it was contrary to all chemical knowledge, and that I and all who had been working it must be mistaken in our facts. He has, however, since then investigated the matter, and told me the other day that it was most extraordinary that, by simply heating the liquor as Mr. Hills does, the SH and CO_2 could be separated from the NH_3, which is left in solution, while the two former gases are driven off.

So far as can at present be understood, it appears that at a temperature approaching 212° the affinity of ammonia, as contained in gas liquor, for CO_2 and SH is completely annihilated, while so long as the liquor is kept below the boiling point the water still retains its hold on the ammonia, the result being that by a suitable application of heat the two gases named can be separated from the ammonia, which is left in a more or less caustic state in the liquor.

The apparatus to effect this object is of a very simple and inexpensive character; a reference to the drawing will make the following explanation intelligible.



HILLS'S LIQUOR PROCESS.

The principal and only essential parts are an ordinary boiler and a small coke scrubber. In my case the boiler is of the plain cylindrical form, 28 feet long and 5 feet 6 inches diameter; it cost, second-hand, £53; and the scrubber consists of two ordinary 30-inch pipes, fitted with a couple of trays, and filled with coke. At the outlet from the boiler is placed a vessel supplied with cold water, through which the liquor may be passed in order to cool it, though the hot liquor may at once be passed into the condenser if a horizontal one be used.

The crude liquor is supplied by the small pipe, *a*—a 2-inch service—to the top of the scrubber, and finds its way through the coke, meeting in its passage downwards an ascending current of gases, consisting of carbonic acid, sulphuretted hydrogen, and a little ammonia, which are driven off from the liquor in the boiler, and reach the scrubber by means of the 5-inch pipe connecting the two vessels. These gases give up their heat to the descending liquor, which absorbs and carries back to the boiler all the ammonia, so long as the liquor is supplied in sufficient quantity to keep the upper part of the scrubber quite cool. If this becomes perceptibly warm to the hand, a trace of ammonia, as indicated by turmeric paper, escapes with the other gases from the scrubber, and is lost. From the top of the scrubber a 5-inch pipe conveys the waste gases to an open oxide purifier, which absorbs the sulphuretted hydrogen, and permits the escape of the carbonic acid into the air. These oxide purifiers, two in number, are built of 9-inch brickwork in cement, and placed side by side; when one becomes foul it is shut off and left for revivification, and the gases are turned into the other. This effectually prevents all nuisance by inexpensive means, since the oxide, when too far gone for purifying gas, is suitable for this purpose. To ascertain the heat in the boiler, a thermometer is placed in the upper part over the fire, and no difficulty is found in keeping the heat constant at about 205°.

The liquor, as it leaves the scrubber, passes down the 5-inch pipe to the "syphon," whence it is conducted by a 2-inch pipe into the boiler. This pipe terminates in a tapered nozzle, put on for the purpose of imparting a slight velocity to the issuing stream of liquor, in the hope of assisting the natural circulation of the liquor in the boiler. I imagine that the heat of the fire causes the liquor to rise and to flow along the surface to the farther end, where the outlet-pipe is placed, leading to the cooler or to the condenser. It is important to take care that the caustic liquor is not brought into contact with the air, or a great loss of ammonia will ensue. It must, therefore, be either sent direct into the condenser, or if a washer forms part of the purifying apparatus, it may very suitably be sent from the cooler into that vessel. By sending it into the condenser, a portion of the ammonia takes the gaseous form, and diffuses itself in the gas, while the caustic liquor is not exposed to the air until it has absorbed a portion of the impurities from the gas and its temperature has been reduced; it is then pumped into the scrubbers.

Though this plan has considerable advantages, I cannot say it is the best that can be adopted, for it raises the temperature of the gas considerably; but it is easy of application, and may be adopted where more suitable means do not exist, with very good results. I have, in fact, for the past twelve months, been

obliged to work in this way, not having had the opportunity, until lately, of devising more appropriate apparatus for applying the liquor to the gas.

When I first tried this process in 1870 for the purpose of dealing with sulphuretted hydrogen only, it was given up because the loss of ammonia was greater than the saving of oxide. I have since found that this loss was entirely owing to the partial exposure of the caustic liquor to the air in an undergound tank. This loss is now entirely prevented, as the following tests and statement will show most conclusively.

1. The application of turmeric paper to the driven-off gases, on their way to the oxide purifier, never shows the presence of ammonia.

2. By testing the liquor with acid as it enters the scrubber, and as it leaves the boiler, the strength at inlet and outlet is never found to vary.

3. During the December half of last year, the whole of the liquor made at the South Metropolitan works was passed certainly twice through the apparatus, and the liquor made for sale during that half year exceeded 22 gallons of 10-oz. strength per ton of coal used, which is a quantity that has not been surpassed when working in the ordinary way.

This evidence is, then, perfectly conclusive that no loss whatever of ammonia takes place by this process; and this I consider the most important statement I have to make, for loss of ammonia is loss of money, and would be fatal to the system.

As to cost, the outlay on two boilers, two scrubbers, and the two purifiers—for boilers and scrubbers must be in duplicate—did not exceed £300. Each boiler is capable of treating at least 600 gallons of liquor an hour, the expense being for one man's wages, night and day, and the fuel, about a chaldron of coke in 24 hours; for one boiler, say £1 per diem for fuel and labour. Then there is the pumping, which I cannot very well estimate, as it is done by the same engine and pumps that do all the other work. In the depth of winter the double apparatus was at work, dealing with about 24,000 gallons of liquor every day, or about three times the total quantity made, at a cost for labour and fuel not exceeding 35s., which effected a saving of from 8 to 10 yards of lime, costing from £4 to £5. The boilers need occasional cleaning, but there is no corrosion of the metal, and very little scale is deposited.

Were it not for the necessity to reduce the sulphur compounds, the purification from CO_2 and SH could be almost entirely accomplished by means of the liquor, charging the ordinary purifiers with oxide, simply as catch vessels; but an alkaline sulphide being needed for the sulphur compounds, the use of oxide has been almost entirely discontinued, and the purifiers charged with lime. During the months of February, March, and April in the present year, the coals carbonized amounted to 22,880 tons, and the lime used to 528 yards, which works out to 43 tons of coal to one yard of lime; whereas, had the purified liquor not been used to remove the carbonic acid, the quantity of lime would have been doubled.

So far as I have gone, the purified liquor has been chiefly used for absorbing CO_2 from the gas, though it also absorbs a considerable proportion of the sulphuretted hydrogen. The former impurity is, however, removed to such an extent that the quantity left in the gas as it leaves the scrubbers, is too small to be estimated by the Cooper's tube, while by the lime-water test discoloration takes place so slowly that the gas may be considered almost absolutely free from this impurity; thus relieving the lime of over half its work, and relieving the apparatus of the excessive pressure caused by the caking of the carbonate of lime. I have, by repeated testings of the liquor, which I prefer using at about 10 oz. strength, the test being a solution of sulphate of iron, found that the purified liquor contains less than one-fourth as much SH as it held in combination previous to the heating process, and this agrees with analyses made by a professional chemist, who also tested for CO_2, the result being as follows:—

	CO_2.		SH.
Crude liquor	1754	..	661 cubic inches in 1 gallon.
Purified liquor	178	..	169 ,, ,, ,,

These quantities are not constant, but the general result shows that nine-tenths of the carbonic acid is driven off, and three-fourths of the sulphuretted hydrogen. It is quite possible to drive off the whole of these gases, but at the cost of a little ammonia which flies off with them; it is, therefore, better to work just within the limit at which all the NH_3 is saved, the small quantities of the other gases remaining being probably due to the power of the water to hold them in solution.

The quantity of impurities contained in the samples of crude liquor, as shown by the above analyses, is comparatively small, which is owing chiefly to the imperfect means at my disposal for bringing the gas into effective contact with the liquor. For this purpose I consider a washer, such, for instance, as Mr. Anderson uses, superior to a scrubber, for I find, on referring to his valuable paper on purification last year, that his 14½-oz. liquor contained 5000 cubic inches of foul gases per gallon. Mr. Kirkham found in a gallon of 10-oz. liquor as much as 4704 cubic inches of CO_2, and 1362 cubic inches of SH—together, 6066 inches of foul gases in a gallon of liquor of 10-oz. strength; but even Mr. Kirkham's large quantities, as will be shown, form but a small proportion of the CO_2 and SH in the gas; for, taking 21 gallons of 10-oz. liquor as the make from a ton of coal, the absorption of CO_2 by the 21 gallons of liquor amounts only to 57 cubic feet, and of SH to 16 feet.

The actual weight of ammonia obtained from a ton of Newcastle coal I find to be about 4½ lbs.—21 gallons of 10 oz. liquor contains about this quantity. If we assume that 1 per cent. of sulphuretted hydrogen, and about 2½ per cent. of carbonic acid, exist in ordinary gas—though I do not vouch for the absolute correctness of these quantities—there will be something like 9 lbs. of SH and 29 lbs. of CO_2 in the gas from a ton of coal, or, to put it in feet—

Ammonia	4½ lbs.	..	100 cub. ft.	..	1 per ct. by vol. of gas.
Sulphuretted hydrogen	9 ,,	..	100 ,,	..	1 ,, ,, ,,
Carbonic acid . . .	29 ,,	..	250 ,,	..	2½ ,, ,, ,,

Now, to form a simple carbonate, the 4½ lbs. of ammonia needs to combine with nearly 6 lbs., or about 50 feet of CO_2; and for a simple sulphide, the 4½ lbs. of NH_3 needs to combine with its own weight (or again 50 feet) of sulphuretted hydrogen. Combinations, however, do *not* take place in this regular theoretical manner; the proportions vary greatly, and a carbonate, or even a bicarbonate of ammonia, has the power of absorbing a considerable quantity of SH, though not nearly so much as pure ammonia. I found by experiment that a solution of bicarbonate of ammonia absorbed two parts, while a solution of pure ammonia took up six parts of sulphuretted hydrogen in a given time, both solutions containing the same quantity of ammonia. At any rate, supposing the ammonia in crude gas to combine with a single equivalent of CO_2, equal to 50 cubic feet per ton, this is less than one-fourth of the carbonic acid; if a bicarbonate is formed, which I doubt altogether, the 4½ lbs. of NH_3 would fix about 12 lbs. of CO_2. On the whole, taking these figures in conjunction with the quantity of liquor used in working the process, it is my opinion that the ammonia in the gas certainly does not exceed one-third of the quantity necessary to combine with and fix the whole of the CO_2, to say nothing about the SH. I therefore consider that the whole of the ammoniacal liquor produced must be treated twice over, if the carbonic acid is to be dealt with effectively, and unless this be the case, any trial of this liquor process will result in disappointment.

At present the purified liquor is used mainly for removing carbonic acid, leaving the lime to absorb sufficient SH to convert it into sulphide, and so to deal with the sulphur compounds; but we are not going to stop here. Sulphide of ammonia, or ammonium, as the chemists call it, when free from CO_2, has been proved by experiment to be as effective an absorbent of the sulphur compounds as is the foul lime; and I have very good reasons for expecting that, in conjunction with this process of Mr. Hills, a means simple and cheap will be found of obtaining the ammonia sulphide, so that we shall ere long be using the rough caustic liquor for the CO_2 and SH, a solution of sulphide of ammonium for the obnoxious sulphur compounds (these solutions will probably be used in suitable washers), a little water in a scrubber or scrubbers for the remaining ammonia, while the existing purifiers will be charged with oxide only as catch purifiers; thus cheaply and effectively accomplishing the complete purification of gas in closed vessels without nuisance, while the abominable use of lime will be done with for ever.

Mr. G. Anderson said he thought great credit was due to Mr. Livesey for having given to the association so liberally the results of his experience. All that he (Mr. Anderson) wished to remark upon the paper was that Mr. Livesey seemed, as far as he had gone, to have removed the carbonic acid by caustic ammonia, instead of by an alkali—lime. For his own part he did not consider that the use of ammonia in the place of lime was any improvement. Mr. Livesey stated that the result of his working showed that one yard of lime would suffice for 42 or 43 tons of coal, whereas he (Mr. Anderson) showed last year that by the use of one ton of lime he could purify the gas produced by the carbonization of 70 tons of coal. It therefore was a question to him whether the new process was any improvement.

Mr. Douglas (Waltham Cross) said his experience was that 50 tons of coal could be purified with one yard of lime. The foul lime purified the gas best.

Mr. Warren (Crewe) said Mr. Livesey had given three tests of the purity of the gas submitted to this process. First, the absence of any trace of ammonia by the turmeric paper; but that did not appear to him conclusive; it might be accounted for by the combined ammonia going over, so that no free ammonia remained. The second test was that the bulk of the liquor was the same at the outlet as at the inlet. It ought to be a little stronger. The third test was that as much liquor was made for sale by this process as by the former mode adopted, which ought to be conclusive.

Mr. Watson (Sydenham) thought the members of the association were much indebted to Mr. Livesey for his lucid and comprehensive paper. The sooner gas managers adopted the plan of taking some of the impurities to divest their gas of other impurities, which had now to be taken out by expensive processes, the better. Some two years ago he (Mr. Watson) happened to stumble on a process which he believed answered as well as that of Mr. Hills. He took the hot liquor from the bottom of a common ammonia still, and washed with that, and he found, by recent analyses made by eminent chemists, that the constituents of the liquor were the same. Still he must confess that no little credit was due to Mr. Livesey for the step he had taken in this direction, and he was in hope that what had been stated in the paper just read would set inventive minds to work, so that in another twelve months they might expect some real progress in the matter. He ventured last year, when speaking on this point, to say that he looked upon washing as a thing of the past. A twelvemonths added experience fully justified him in endorsing that observation.

Mr. Paterson (Cheltenham) said he presumed that, when Mr. Watson said he was washing his gas with the liquor taken from the ammonia still, he meant the Coffey still used in the manufacture of sulphate of ammonia. But he thought it would be well to be informed more definitely on the point. For himself, he thought the ammoniacal liquor which was put into the Coffey still, and treated very effectively with high pressure steam, must be deprived absolutely of all its free ammonia before it reached the bottom; and he, therefore, could not comprehend how Mr. Watson purified his gas with that liquor. He (Mr. Paterson) had been in the habit of manufacturing sulphate of ammonia with the same description of apparatus employed by Mr. Watson, and he had repeatedly tried to get results such as had been referred to, but he could make nothing from it. The liquor, in fact, had no more effect than pure water. There was one point mentioned by Mr. Livesey upon which it was desirable to have a little more information. It seemed to him, from what he had heard, that Mr. Livesey treated his liquor, in the process described, after it had left the hydraulic main. The liquor, of course, must be very weak. He thought Mr. Livesey had underestimated the quantity of ammonia in the ton of coal. His own experience was that, with Midland and Yorkshire coal, he could get a much larger quantity, by this treatment of the liquor, than had been mentioned. He should not think of using a process like this, except as a supplementary one. The actual results obtained from the treatment of the simple liquor were so encouraging that, with the proper application of a washer, he believed they might purify the gas from quite three-fourths of its carbonic acid, without in any way treating the liquor for a decarbonating process.

Mr. C. E. Jones (Chesterfield) asked how much "sulphur in other forms" than sulphuretted hydrogen was found in the gas at the outlet of the scrubber after this washing process.

Mr. Graham (Stalybridge) asked what became of the sulphuretted hydrogen and carbonic acid after they left the boiler.

Mr. Douglas (Portsea) said the question which arose out of the paper read by Mr. Livesey was as to the commercial advantage of the liquor process over the lime process. The consideration of the commercial question was a very important one for the members of the association, and they owed a great debt of gratitude to Mr. Livesey, not only for the present communication, but also for the persistent efforts made by him year after year to cheapen the manufacture of gas. The evidence given by Mr. Livesey recently justified the statement that no man's opinions on these subjects were received with greater force and weight than his, when speaking of the cheap and effective production of gas. He would like to ask Mr. Livesey what quantity of cannel he had to use by this process—whether more or less than by the lime process—because if there was a necessity for using a greater quantity of cannel to increase the illuminating power of the gas, it might be that the cost in this direction would unfortunately be greater than the saving derived from this liquor process.

Mr. G. Livesey, in reply to the several questions, said he must first of all remark that he was very much gratified at the kind manner in which the members had received his paper. It was not exactly the communication he should like to have laid before the association, as the experiments had not been carried out to the desired extent. With reference to Mr. Anderson's remarks, he might say at once that he had never been able to touch that gentleman in the matter of economy by the use of lime. His comparison was between what quantity he had to employ when he did not use the liquor, and what he employed when he did use it. He thus found that he saved half his lime. He could not leave lime in his purifiers until it became carbonated, or he would have the officers of the Board of Works to report upon him. That in London he could not manage so well as Mr. Anderson at Dover, was, perhaps, because his purifiers were not so large. The comparison he made as to the lime—viz., 43 tons of coal to one yard of lime—was the result of his experience of this process; if he did not use the liquor, he would require one yard of lime to every 22 tons of coal. That was, in fact, the proportion used by other London works. Mr. Warren spoke about the three tests. He (Mr. Livesey) believed that carbonate of ammonia would stain turmeric paper almost, if not quite as readily as free ammonia. As to the question of bulk, he admitted that there might be something in it, but the reduction in the bulk of liquor was so small as to be quite inappreciable. No vapour or liquor went off with the gas, seeing that the heat was quite under the boiling point in the boiler, and the cold liquor brought back any vapour into the boiler, so that there practically was no loss. The trifling difference in bulk caused by the abstraction of the carbonic acid and sulphuretted hydrogen was too small to be perceptible by the acid test. The other experience was that upon which he relied—viz., that he never made more liquor for sale than in the last half year, and the whole of it was passed through the apparatus two

or three times. Mr. Watson stated that the spent liquor from his Coffey's still acted in the washer. He (Mr. Livesey) was not disposed to dispute it, because he had seen other things which no one would have believed, and which he could not dispute either. He had been served the same, in fact, himself, and, as he mentioned in his paper, a very eminent chemist once said he did not believe in the results obtained by this process. It might, therefore, well be that there was something in the use of this liquor mentioned by Mr. Watson not as yet described. Mr. Paterson asked for information about the gas liquor, and said that it must be very weak, as he presumed it was taken from the hydraulic. He (Mr. Livesey) took the strongest liquor he could get—10 oz. strength he liked to have it as it left the scrubbers. He then, in his present rough way of applying the process, sent it back into the condenser. Mr. Paterson said something about the quantity of ammonia. He (Mr. Livesey) had calculated it at 4½ lbs. from 21 gallons of 10 oz. strength per ton of coal. If they could get 30 gallons, of course they would have nearly half as much again, but he found 21 or 22 gallons of 10 oz. strength was as much as he could obtain from Newcastle coal. He did not agree with Mr. Paterson that this process should be looked upon as a supplementary process; he thought it gave promise of being a primary one, and the only one necessary. He had very good hope that it might be brought to bear in that way. Mr. Jones asked about "sulphur in other forms," and in reply he would say that, so far as he had gone, the liquor did not appear to touch it. The "sulphur in other forms" was unaffected by anything except the sulphide of lime, so that the gas, as it left the scrubber, contained about the same amount as when it entered. It was found, from the valuable experiments of the late referees, that the gas, as it left the scrubber, sometimes contained more "sulphur in other forms" than when it entered. He was in hopes that a process might be found whereby we might be able to make effectively and cheaply a pure sulphide of ammonia, which he had no doubt would act powerfully on the sulphur compounds, so that, as he said in his paper, they might use this and the caustic ammonia and water as the only purifying agents. The oxide purifier would then be charged only for the purpose of catching any little sulphuretted hydrogen remaining. Mr. Graham asked where sulphuretted hydrogen and carbonic acid went to. They passed through the oxide—at least the carbonic acid did—and the sulphuretted hydrogen was stopped in it. The question, as Mr. Douglas put it, on which the value of the process hinged, was the commercial question, and so far as his (Mr. Livesey's) experience went, it was decidedly in its favour, for he found that by an expenditure of 35s. a day he could save £4. Then as to the use of cannel last year, by the official testings, made by the officers of the Board of Works, the gas of the South Metropolitan Company was scarcely ever under 16 candles—the average for each of the four quarters was over 16, and in three cases it was 16½. The production of gas was 9750 cubic feet per ton of coal, and on two or three occasions only he used cannel. Taking the whole year's working, he did not use cannel at all for the sake of increasing the illuminating power of his gas.

The PRESIDENT expressed his great satisfaction in listening to the paper and the discussion which it had elicited. Mr. Livesey had fully sustained and supported by argument the principles he brought forward, and the whole question would be a very interesting one for further consideration and study when it appeared in the report.

Mr. G. ANDERSON (London) read the following paper on

BUILDING AND HEATING RETORTS.

In an economic point of view, the setting and heating of retorts is the most important one in gas manufacture.

In all publications on the subject, from the shilling pamphlet with its woodcuts to the 30 shilling volume with its steel engravings, this branch necessarily forms the most important feature. Even in the periodical literature of the profession, we have lately had the whole subject illustrated and discussed at considerable length, and the past proceedings of our own society prove the attention the subject has had from ourselves.

With all those sources of information before you, I would prefer not to occupy your time by going over ground that has been so ably treated by others. I would rather confine myself to a few points which may have escaped, or which, perhaps, have never occupied their attention. We will, therefore, be on new territory, touching which it may even be respectable to differ; and no one will be better pleased than myself to hear those differences of opinion.

To begin, then, we must prepare our foundation, and I take it that, either by nature or art, we make this of a character not to yield under the weight it has to carry; but there are other points deserving of consideration.

First, is the ground usually damp, say a few feet underground; and, if we are on an alluvial soil, and only a few feet above the drainage line of the country, it very likely is.

Now, damp ground is an excellent conductor of heat; it will rob the retorts, by conduction into the ground of that heat which should distil the coal, and one of two things will happen—you must use more fuel, or make less gas.

I will give two instances in proof. I was once in charge of a gas-work where the lower retorts lost temperature as surely as the water-line of the drainage rose. I made a drain round the retorts, and kept it pumped, and received considerable benefit; but, in a succeeding year, I raised the retorts a couple of feet, which cured it.

In another case, where I was passing a drain through a retort-house, to maintain a fall I had to sink something like 20 feet as it passed the retorts, and the water that percolated into the excavation was warm at that depth.

But, suppose we have a foundation of rock, it will happen, at certain seasons, that a current of water passes underground along the surface of the rock. This, too, would rob the retorts of heat, and in a manner that would give no indication, save in the effects produced. It appears, then, that, unless where the retorts are worked from stages, it would be well to form a drain all round the retort-benches, as one feature in the formation of the foundation.

In preparing the foundation, I specify that it shall have a fall of 3 inches towards the back, for a reason to be referred to afterwards.

We are now ready to build the side walls and the arch, respecting which I would refer to the great desirability of *thin* joints of fire-clay, as distinguished from thick ones.

The bricklayers who do my work know that unless it is of first-class description it will not pass. I was inspecting some benches in course of construction lately, that particularly pleased me. I measured the height of 10 courses of brickwork in the side walls. I then placed 10 bricks on top of each other, dry, and measured them, and found them only half an inch less than those built in the walls, so that we had 10 joints in the thickness of half an inch.

We know that fire-bricks are made of the same material they are built with; we know that a brick when first formed in the mould is from a quarter to three-eighths of an inch thicker than when it is burnt, and as we have to burn all the fire-clay built in the walls while producing our gas, it follows that, to have little shrinkage of the mass, and the least displacement of its component parts, the less fire-clay we use the better, consistent with sound work.

I dare say most of you have noticed that after a year or two the arches of the ovens have a tendency to get low midway of their length.

The outer end of the arch is kept in its place by the filling in of the front wall. The arch at the centre of the oven is exposed to more heat than it is at either end; hence it shrinks more, and necessarily sinks more. To check this tendency, I construct those arches with a camber of a couple of inches in the direction of their length, so that they must sink that much before they come to the straight line in which such arches are usually built.

These arches are usually of 9 inches thick, with a filling-in of common brickwork a foot thick to keep in the heat; and it has been usual to construct this filling-in on top in rather a careless manner with broken bricks, finishing off on top with a decent paving one course in thickness.

I prefer, in constructing this filling-in, to do it in the best possible manner, forming two of 4½-inch arches, instead of the bricks laid in ordinary courses. I thus relieve the fire-brick arch of much weight, which must prevent it from sinking, and make it last longer. The quantity of material used is in each case the same, the only extra expense is a little more care in the workmanship.

I stated that the surface of the foundation was made with a fall of 3 inches to the back; the object of this is, that the retorts may lie 3 inches lower at the back than the front, and cause the tar which descends from the ascension-pipes and used to settle in the mouthpieces when the retorts were set level, to run back into the retort, and get converted into gas.

The absence of tar in the mouthpiece also makes the drawing of the charge a much cleaner job for the men and also for the neighbourhood than when the red-hot coke is drawn over a pool of tar, which I have too often seen, causing a cloud of smoke to issue from the retort-house ventilators, that was enough to make the uninitiated think that some disaster was occurring.

The fixing of the mouthpieces to the retorts should also be watched, that the interior of the mouthpiece shall be the highest, for if the retort only shows one-fourth of an inch above the iron of the mouthpiece it will be impossible for tar to run into the retort till the basin thus formed is filled.

I am aware that in some well-regulated works the tar is removed from the mouthpieces before drawing begins, and poured on the coal and covered up, and until you set your retorts with a fall you should all do this; for it is certainly improper to have clouds of smoke passing off from your works into the lungs of Her Majesty's subjects, which ought to be made into gas and sold to them for the benefit of our shareholders.

The next question to which I would direct your attention is, in what part of the oven, in relation to the retorts, should we place the furnace that is to heat them? There are so many positions in which this is put that there is plenty of room for discussion. Some have settings of five—two tops, three below them, and the furnace under the centre one of the lower three. In larger works we have seven placed, the upper five similar to the last, but two more added, one on each side of the furnace; and in larger and more recent works I have seen these set in three rows of three retorts each, with the furnace-bars 4 feet lower still, in this case fired from under the stage, or in what is called "the coke-hole." I do not think in either of these cases is the furnace in the proper position, having regard to "wear and tear" of retorts or economy of fuel, because—

1. In order to reduce the quantity of heat lost by conduction into the ground, the narrower we can have our ovens, consistent with holding the proper number of retorts, the better; therefore, the setting of five, set two, two, and one at top, could do with 20 per cent. less width than when set three and two. And here let me remark that 20 per cent. less retort-house would do.

2. There being an open space over the furnace all the way up to the upper retort, when the centre lower retort over the fire is removed, the furnace can be placed higher up among the retorts it is to heat, instead of being altogether below them.

3. In the case of the five retorts, and also in that of the seven retorts, the centre retort over the fire always gets hotter than any of the others, it is sooner destroyed; and, as it forms the foundation on which the upper retorts rest, any destruction of it injures those above it; and

4. When the retorts have to be repaired, it is difficult, and sometimes impossible to get at four out of the seven retorts—namely, the two tops and the two outsides, without taking out this centre retort; and if you do take out this retort to get at those four, the doing so necessarily removes the foundation from under them, and may—often does—do them further injury.

The same applies to the settings of nine, to which I have referred, only the evil is exaggerated.

I will now describe the form of settings I have employed for many years, in which none of the foregoing evils apply.

Instead of seven, I set only six retorts; the furnace is placed higher up, partly in the position where the centre retort over the fire was. The furnace is, therefore, up among the retorts, giving out its heat all round, more equally distant from all the retorts, yet not so near any one as to injure it. (See drawings.)

None of those retorts rest on the walls of the furnace-house. When this has to be repaired, which it usually does every six or eight months, while the retorts will last for several years, it is never necessary to disturb the retorts while repairing the furnace; and when the bricklayer is inside repairing the furnace, he has not only plenty of room to do his work, but he can properly examine the whole of the retorts, and, if need be, make a repair to any retort that may require it.

I now invite your attention to the form of the furnace itself. This is so various, as carried out by different engineers, and it is a matter of so much importance, and I will have to take exception to the forms I will refer to, and which are to be found in some of our largest and most recently constructed gas-works, that here there will be ample room for discussion.

Before proceeding to criticize, however, I deem it necessary to lay down a few truisms on the nature and theory of combustion, as a groundwork on which I will base my objections.

Our fuel, then, when in action, whether it be coke, coal, or tar, is carbon at a red heat. This carbon, to be burnt, must be supplied with a current of air containing oxygen, which we draw from the atmosphere through the furnace-bars by the draught in the chimney.

There are, at least, two chemical combinations which the oxygen of the atmosphere makes with the carbon of our fuel—one is carbonic oxide, or one atom of each; another is carbonic acid, or two atoms of oxygen to one of carbon.

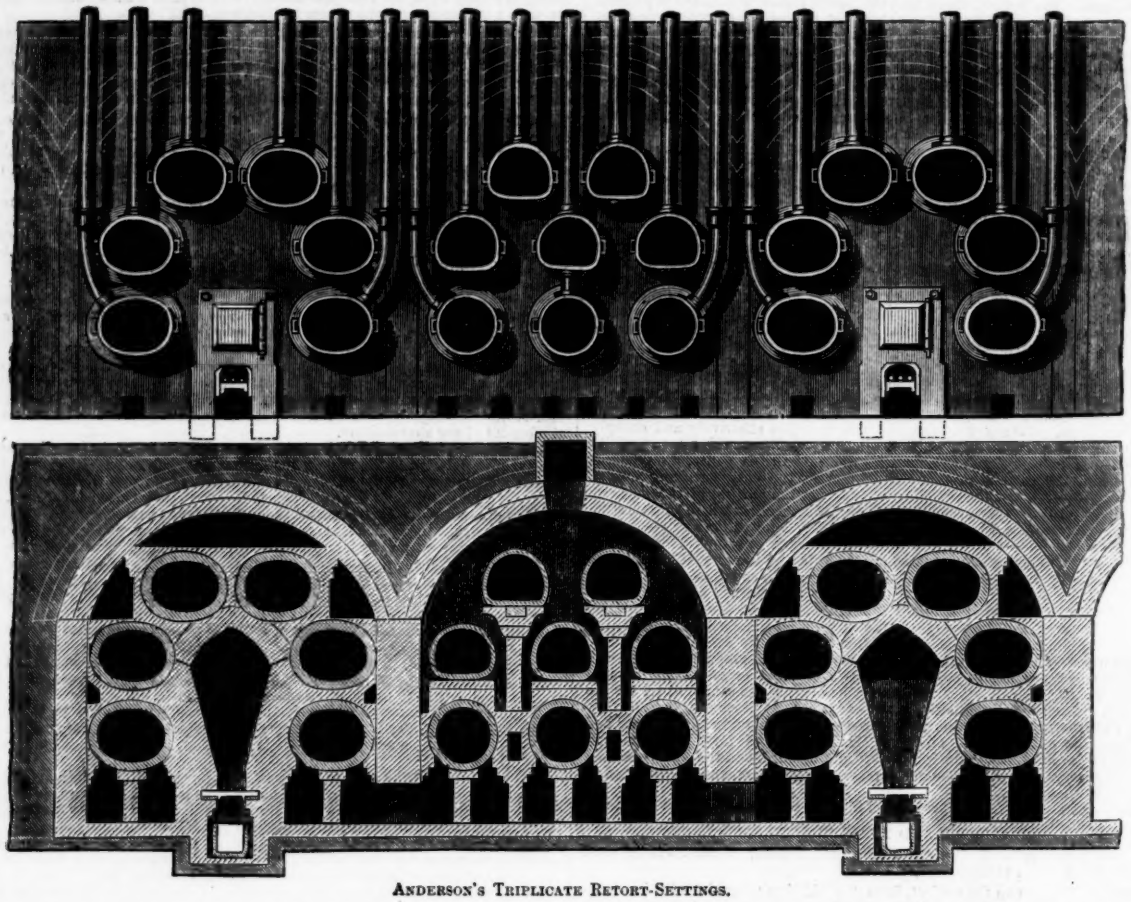
It depends on the shape of the furnace, and the quantity of air we admit, whether we produce carbonic oxide or carbonic acid.

In carbonic oxide there exists one atom of the carbon unconsumed, and we cannot burn this second atom without giving it the other necessary atom of oxygen. Now, from these postulates it follows that if, from the construction of the furnace, and the quantity of air we admit, we convert the fuel into carbonic oxide, instead of into carbonic acid, we lose one atom, or say 50 per cent. of our fuel, or, if the furnace is sometimes producing carbonic oxide and sometimes carbonic acid, we are wasting fuel to the extent that carbonic oxide is formed.

That some furnaces do produce carbonic oxide I know, because I have frequently seen it done; and that many cannot but produce it, I also believe, from the form given to them.

Whenever you see a flame at the top of a chimney after sundown, you see a factory where carbonic oxide is being thrown into the air, and fuel lost; and if you will go into the factory and open the furnace-doors (which will admit more oxygen), you will probably find the flame disappear. In the same way, whenever you remove the sight-holes in the upper front of a setting of retorts, and find a pale bluish flame issue, here again you have imperfectly burnt fuel and loss.

Do not, however, suppose that there is a flame, such as you see at the chimney top, all the way up inside, or that there is a flame inside the retort-oven like that you see issue from the sight-hole. No; there may be no such flame in either case, there is only carbonic oxide gas very hot, hot enough to become flame when it meets, which it does in the atmosphere, with the other atom of oxygen it requires to convert it into carbonic acid. Do not imagine either that I recommend you to open your furnace-doors to supply the needful atom of oxygen. No. I only show you how it may be supplied, not how it ought, for



ANDERSON'S TRIPLICATE RETORT-SETTINGS.

the whole of the air admitted to a furnace had better pass through the bars and through the fuel than in at the door and only over it.

How, then, is this carbonic oxide produced, and what should we do to produce only carbonic acid in which we will obtain the benefit of the whole of the fuel?

Carbonic oxide is produced by what is known as thick firing. It is also produced when sufficient air cannot get through the bars, as when they are very much clinkered over.

Take the case of a deep fire, which has come somewhat into fashion of late, where, to ease the men, the furnace is made so deep that you can put 3 or 4 feet in depth of coke on at a time. The air passing through the bars, say for 1 foot up through the fuel, gets converted into carbonic acid; but in passing up through the other 2 or 3 feet in depth, it takes up an atom of carbon, which it cannot part with, and passes on through the flues and out at the chimney as carbonic oxide. When the fuel has burnt sufficiently low, the whole of it gets converted into carbonic acid, and then no waste takes place; and here we have the furnace which I say is producing carbonic acid one part of its time and carbonic oxide the other, and that it cannot help doing so.

I have noticed a considerable variation in the amount of coke left for sale in various companies using the same class of coal, and the solution of this I have generally heard put to the various quantities of coke sold as a chaldron by the several companies. This, no doubt, to some extent, does account for the differences, but I am inclined to believe that part of it is also due to more perfect combustion being obtained in the works that show the best fuel account; and I submit that to talk of a chaldron of coke being a different quantity in different places of sale is a loose and unsatisfactory way of putting it. A chaldron of coke should be a known fixed quantity as a ton of coal is, and managers should not shelter apparantly bad results under an excuse so open to doubt.

How, then, are we to construct our furnaces so that we shall only, or as near as possible only, produce carbonic acid?

We should construct them much shallower, so that say not more than 18 inches of fuel can be put on at a time; and we should construct them hopper-shaped with sloping slides, so that as the fuel burnt low it would sink, clinging together, and not get into holes by which air can pass through the bars and up through the holes in the fuel, without being properly brought into contact with it; for in this case we are producing another product that is neither carbonic oxide nor carbonic acid, but merely heated air. We are thus expending fuel in heating air instead of heating retorts.

This is no fancy sketch. I have seen, when the furnace had vertical sides and wide bar space, that when the fire got low the pieces of coke were actually lying apart, with air spaces between as I describe.

The subject of comparatively narrow bar space and sloping sides to the furnace is one, among many others, that I learned in my long intercourse with Mr. Croll, who better understood the theory of combustion and its application in our profession than any other man whose views I have become acquainted with; and I may state that while he held the Great Central and Surrey Consumers works, in both of which I was engaged, we worked with a fuel account of about two-thirds of that we now find returned by those companies.

In this question of the width of bar space I have seen the most opposite extremes. In out-of-the-way places, where the works were built 20 to 30 years ago, and where the managers did not travel about much to see what others did, I have seen 18-inch width of bar space to heat three retorts; on the other hand, in one of our largest metropolitan works, I have seen a furnace without any bars at all, merely a 3-inch channel, on which the fireman dropped a few large pieces of coke by the hand, then filled up his furnace in the ordinary way. I consider both of those furnaces were badly constructed for the work they had to do, and in utter ignorance of the nature of the duty to be performed.

In the first case the bars were wide enough for a moderate steam-boiler, where great *volume* of heat is required to be carried a great length; but with retorts we require *intensity* rather than volume; hence the bar space should be narrower, that the air may rush through and consume the fuel at a higher temperature, and in the latter case with only a 3-inch channel. It is all but impossible that such a furnace should do other than produce carbonic oxide, with its attendant waste of fuel.

My own practice is to make the bar space from 5 to 9 inches wide, according to the number of retorts to be heated when using coke for fuel; those who use coal would require it wider.

Perhaps I should not close this paper without giving some description of the settings which bear my name, which I have used in various modifications for many years, and which I only so continue to use because I deem them the best I have seen; and as all of you have not applied to me on the subject, it will give you the opportunity of giving your reasons for not having done so.

Being myself lessee of several gas-works—hailing from the northern side of that small stream across which my forefathers used to make incursions for the purpose of studying the breed of your southern cattle, which they loved so much that they seldom returned without bringing some of them north with them, and are generally held even to this day, in their sons, to be a canny, discreet, circumspect, and cautious, far-seeing people—I hope you will not consider it presumption in me if I claim to have some of the best of the ways of my forefathers, and not silly enough to indulge in a thing that does not pay, merely because it is a child of my own. The difference between my settings and others chiefly consist in the use of clay and iron retorts in combination.

While some engineers consider, or did till recently consider, iron retorts the best, and others of equal eminence think clay retort the best, I believe the most economic result is to be obtained by employing both kinds of retort, each in the position best suited to its character.

I do not claim to have originated the idea of using clay and iron retorts in combination. In this matter I am but the follower of such men as George Lowe, John Kirkham, and last, but not least, Alexander Angus Croll—three names that cannot be equalled in our profession, all three representative men, of which the members of our profession may feel justly proud. You see, therefore, I stand on somewhat firm ground; but if I stood alone, I should be inclined to ask reasons from those who dissent from the principle, rather than mere expressions of opinion not supported by facts.

In small or medium works—between 10 and 30 million feet per annum—I employ a setting of nine retorts, seven of which are clay, and two—the last to receive the heat—iron. (See drawing.) The arch is 8 feet 9 inches wide. The heat first plays round the six clay retorts, between which the furnace is constructed; it afterwards passes beneath a thin clay retort of only 2½ inches thick; and, lastly, past the two iron retorts above it. We thus have nine retorts heated by one fire, standing in 8 feet 9 inches width, and all at a convenient height for charging; the lowest being 18 inches above the floor, the highest about 5 feet.

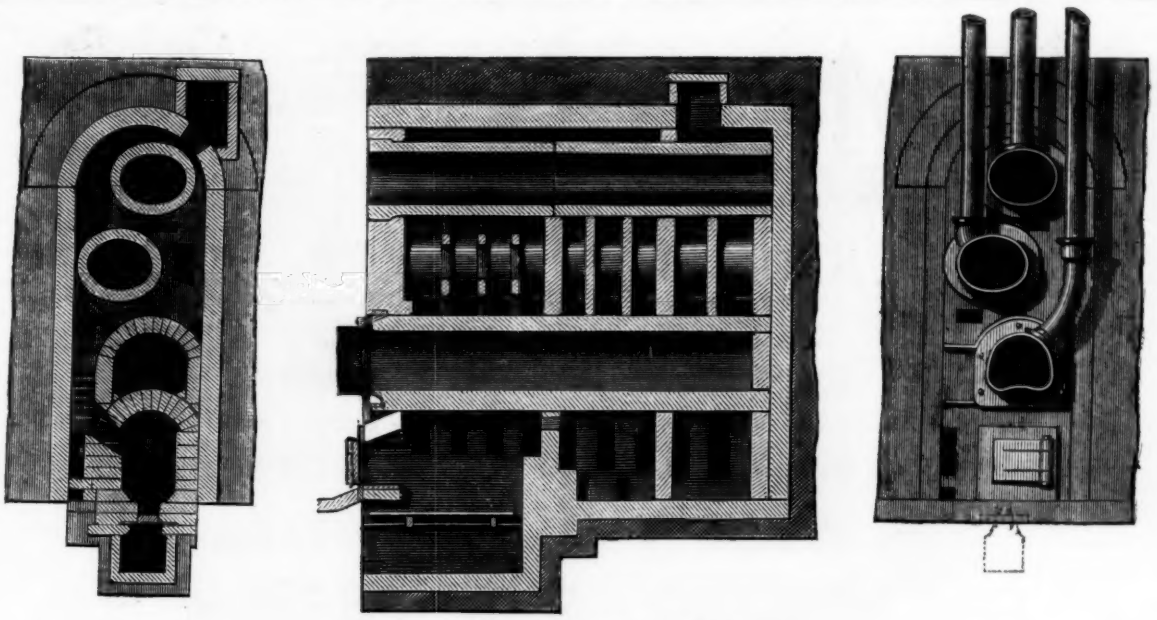
In larger works—from 20 millions per annum to any quantity above that—I employ three ovens, working in combination, each of the two outer ones containing six oval retorts, and a furnace, from whence the heat, passing from both settings, enters the centre one, which is without a furnace, and contains three thin clay retorts and five iron ones over them. (See drawing.)

We have thus 20 retorts heated by two fires. The "ovals" are 18 inches; the "rounds" and the "irons" above them 15 inches wide. We can heat them all to any temperature desired. The ovens are 6 feet 8 inches wide each. The same system I have carried out in arches 5 feet 8 inches wide, with 15-inch "rounds;" in this instance, each of the ovens containing six retorts only, or 18 retorts to two fires.

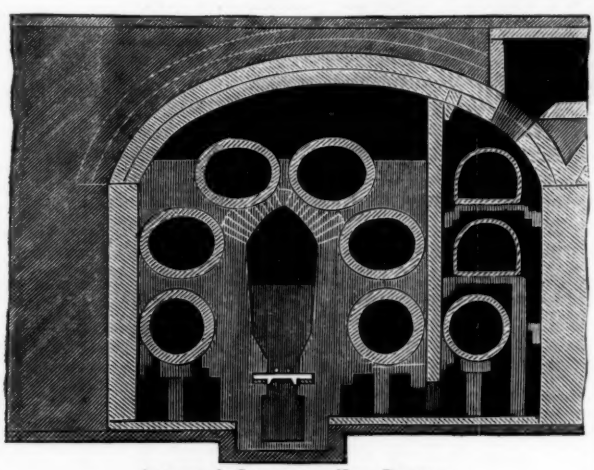
Now, what I claim for this system, and what I want you to dispute if you see fit, is greater economy of fuel, greater economy of construction, and greater economy of wear and tear.

First, greater economy of fuel.

It is a fact that, if you confine yourselves to clay retorts alone, the heat, as it leaves the last of the clay retorts, is still at a very considerable temperature; sufficient, as experience has proved, to distil coal, provided it be in a retort formed of a better heat-conducting material than an earthen retort, and this substance is cast iron.



ANDERSON'S SETTING OF THREE RETORTS.



ANDERSON'S SETTING OF NINE RETORTS.

Compared with an iron retort, a clay one is a feeble conductor; and, therefore, to distil coal in it, you require the heat to be at a higher temperature than is necessary for cast iron.

A cast-iron retort, placed in the position that we place clay ones, and submitted to the high heat they are, would not last three months; but, placed to receive the more moderate temperature in which I place it, will last a couple of years.

The heat, therefore, which I get for the iron retorts is heat which those who only use clay retorts must pass to the main flue and chimney as useless.

Second, greater economy of construction.

The eight retorts in the centre, or blank oven, being two-fifths of the whole, have no furnace, and the internal setting simply consists of the number of pillars necessary to support the retorts.

And, *third*, the wear and tear must be less where there are fewer furnaces to get out of order; and the same applies to the labour of the firemen, which is also considerably diminished from the same cause.

Taking a complete triplate, or three ovens, as shown on the wall, having six oval retorts in each of the outside arches, and three thin clays and five iron retorts in the centre arch, receiving the spent heat from the two former, the money aspect of the matter may be stated thus:—

15 clay retorts, 9 feet long, at 7s. per foot delivered . .	£47	5	0
5 iron retorts, 18 feet each, at 8s. per cwt. delivered . .	36	0	0
Coke to heat them for two years, 1460 chaldrons, at 10s., being one chaldron per day to each furnace	730	0	0
Total	£813	5	0
Clay retorts set in the ordinary way would be 20 clay retorts, same price as above	£63	0	0
Coke to heat them for two years, 2190 chaldrons, at 10s., being one chaldron per day for each of three furnaces .	1045	0	0
Total	£1108	0	0
Balance	£294	15	0

The saving here shown is due entirely to the smaller fuel account; consequently, where fuel is not worth 10s. a chaldron, the saving would be less, and the contrary where it is of more value.

I do not limit the age of a retort to two years, but merely take it as a convenient age, or medium between ages that I have heard stated in discussions in this society.

It may be fairly argued that I have reckoned more than the true value of the merely waste heat. This may to some extent be the case, but there are also economies in my mode that I have not taken into account, such as saving of labour, and of furnace mountings, and the wear and tear of a smaller number of furnaces in relation to the work done.

Before passing from the question of fuel, permit me to strike one note, the sound of which we have heard before; and although no one, so far as I have ever heard, objects to the music of its sound, I am afraid that, while loving the music, its echoes die away on the ear and we forget it. I refer to firing with red-hot coke.

If I were speaking only to gentlemen who managed gas-works where the price of gas can be raised to whatever sum is necessary to enable you to pay your shareholders 10 per cent., I know that any change, that caused you to have to think ever so little, might be rejected; but, happily for you and for me, you are not all in that questionable—I would say unhappy—condition. To those of you, then, who have not arrived at your 10 per cents., and to those of you who cannot lay your miseries before the "Board of Trade," and especially to those of you who if even you can, may think it would be very unpalatable to your customers if you were to moot raising the price, and who cannot, therefore, doze on the acheivements of the past, it may just be well to mention the subject of firing with red-hot coke again.

In theory the thing seems perfect. Red-hot coke must begin to do duty the moment it enters the furnace; not so with coke on which we have thrown water, perhaps saturated it, for not until all the water is evaporated, and the coke is brought to a red heat, can it do any good in the furnace.

With settings of six retorts, working six-hour charges, and drawing two retorts of each setting at a time, you can get a firing of red-hot coke direct from the retorts into the furnace every two hours.

At the Great Central, in Croll's time, we fired with red-hot coke, not direct into the retorts, but into iron boxes, which were wheeled to the furnaces; but the system had this drawback, that a good deal of coke was burnt in those boxes that should have been burnt under the retorts.

A good many years ago I designed a furnace frame, whose door was hinged below instead of at the side, and opened to an angle convenient to rest the end of a short trough on conveying the coke as drawn from the retort into the furnace. Perhaps some gentleman may give us his experience in this matter.

There is just one point, which I deem of some importance, that I would like to mention before I conclude. It has little, perhaps, to do with either the building or the heating of retorts, but it has to do with the convenience of the men in working them, and on that score may find a place.

I refer to the formation of the floor of the retort-house, which is usually made level, but which I make with a fall of 9 inches to 1 foot towards the retorts, making the last 9 inches in width at the retorts rise 2 inches towards the retorts.

This formation of the floor has several advantages. The water thrown on the coke is kept in the valley thus formed, and cannot run down close to the benches and make them damp. The greater amount of barrow and shovel work that goes on immediately in front of the retorts has a constant tendency to reduce the level of the floor at that part, and cause water to lie there and find its way down at the retort-benches, and the rise of the floor towards the wall of the retort-house gives the stoker a manifest advantage either in drawing or charging the top retorts, as it adds 9 inches to 12 inches to his height; in fact, it enables a short man to do with ease what now a tall man only does with difficulty, thus not only giving you a larger choice of men for your work, but placing it within the reach of the short men, who are the strongest and the best.

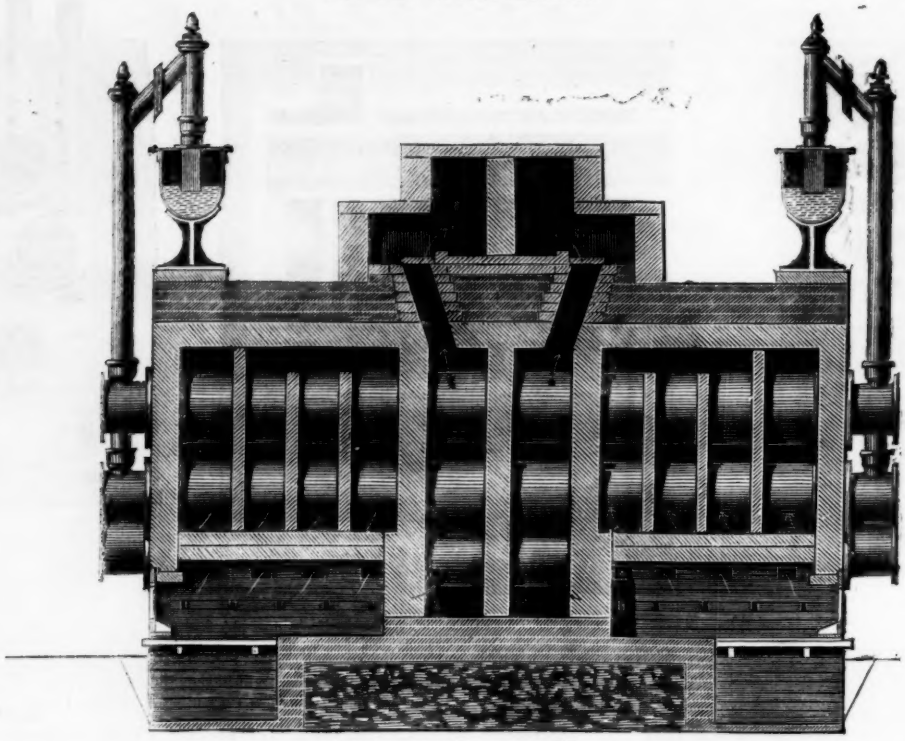
The PRESIDENT said, as there was another paper on retort-settings, he thought it would be better to take the discussion on Mr. Anderson's paper after that was read. He therefore called on

Mr. JOHN TINDALL (Walsall) who read the following paper on

RETORT-SETTINGS, WITH SPECIAL REGARD TO THE CONSTRUCTION OF FURNACES AND ECONOMIZATION OF FUEL.

The subject which I have the pleasure to introduce to this meeting is one of the utmost importance in connexion with the manufacture of gas. Especially has it been so during the last three years, when the carbonizing department, owing to the fabulous price of coal, has required, at the hands of the gas manager, the greatest possible care, skill, and economy, in order that he might be able to hold his own with the public, and give satisfaction to his employers. Any suggestion, therefore, having for its object the saving of fuel or the obtaining of the maximum of heat from the minimum of coal, will, I am sure, be accepted and appreciated by the members of this association. I may further add to this brief preface that, during the last five years, I have devoted a great deal of time to this branch of our business, and that the results which have been obtained by the improved retort-settings and by careful supervision, have amply rewarded me for time and labour expended; the saving of coal in working, during the last four years, when compared with the average of three previous years before the present setting was adopted, was nearly 9000 tons, representing a money value of about £5000.

TINDALL'S RETORT-SETTINGS.

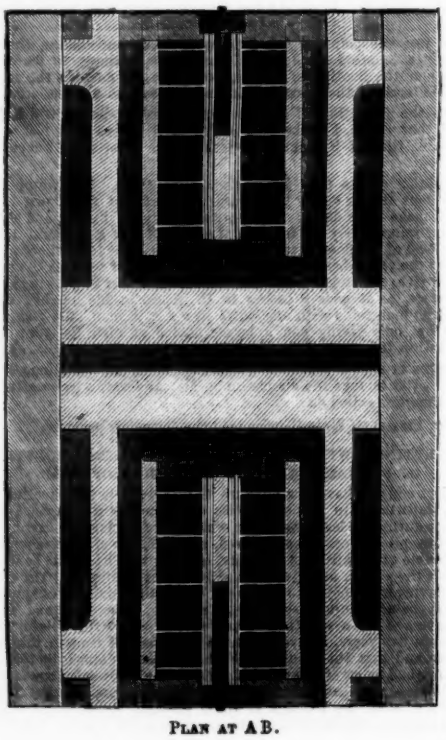


LONGITUDINAL SECTION AT C D.

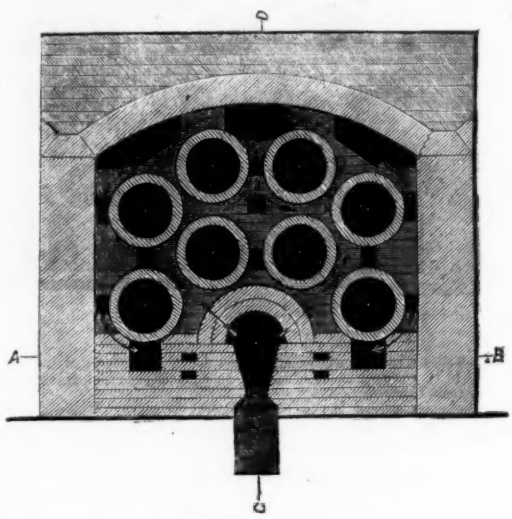
SYSTEM OF WORKING.

The setting of retorts which forms the subject of this paper is one of eight retorts to one fire. They are all circular in shape, and are 9 feet long, 16 inches diameter, and 3 inches thick. The size of the arch in which they are set is as follows:—The opening is 8 feet 3 inches within; from the retort-house floor to the springing of the arch is 6 feet 6 inches; and the arch is struck from a radius of 7 feet. I will just remark here that there is a gradient of 5 inches from the wheeling-plates of the retort-house floor to the front of the retort-bed.

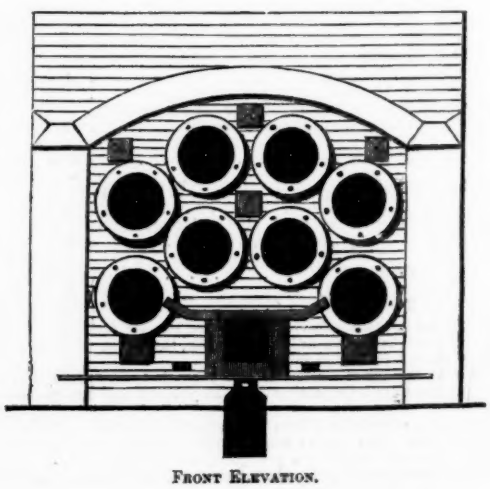
It will be well in the outset to explain the system of working the retorts, as this has a great deal to do with the position in which they are placed in the arch. In the first place the stoking is done by hand and the charging by the shovel. The fuel used is all coal, therefore all the coke made is drawn into the barrows, and wheeled away. There is no coke drawn on the retort-house floor, therefore the bottom retorts must be high enough for a barrow to work well under the mouthpieces, and the top retorts must be a convenient height, so that they may be properly charged. I know that in some works the coke from the bottom retort is drawn on the retort-house floor, and, after being slacked, is thrown into barrows and wheeled away; but I object to this for several reasons. First, there is a great quantity of water thrown on them, and the steam which is generated acts upon the retort-beds, diminishing the heat very considerably. Secondly, the coke is broken up very small, and thereby lessened in suitability as a coke for blast-furnaces, for which purpose it is chiefly used



PLAN AT A B.



TRANSVERSE SECTION.



FRONT ELEVATION.

in the Birmingham district. Thirdly, there is a greater per centage of breeze, causing another loss. The men work two together, one drawing a retort from one bed, while the other is charging one at another bed. This I consider a better system than for each man to draw and charge his own retorts. The work is done more quickly, the retorts are not open so long, and are, consequently, not so much reduced in heat by the cold air entering them. The two men work 20 retorts and the furnaces connected with them, and the quantity of coal carbonized is about 2 tons 3 cwt. per day for each man.

System of Heating.

The retorts being placed in the position shown on the drawing, the heat is directed from the furnace through eight nostrils, four on each side of the furnace arch. It ascends among the retorts until it reaches the crown of the arch of the oven. It is then drawn down to the front of the bed, and passes underneath the bottom of the lower retorts into the chamber at the back. It then ascends among the retorts again, and from the top of this chamber enters the main flue. The distance over which it travels, from the furnace to the main flue, is about 30 feet. I know settings where this distance is much greater, and a saving of fuel thereby is claimed; but, in my experience, I find that the distance I have mentioned is the proper distance, because if it were greater the heat would be very much diminished, and the loss of gas in carbonizing would outweigh the quantity of fuel which would be saved. In the above arrangement of the flues there is a uniform heat applied over the whole surface of the retorts, as I have proved by the heating, which is as nearly as possible alike through their entire length.

The chamber at the back of the retorts, which is 18 inches wide, I believe to be the proper width for this system of heating, though I have tried various sized chambers, from 14 inches to 36 inches. When I applied the 36-inch chamber, the furnace was too much contracted, and too small for its work; the result was a cutting draught, and considerable damage to the furnace and the front of the retorts. When I applied the 14-inch chamber, the furnace was too large, causing a waste of fuel. I therefore adopted the 18-inch chamber, which I found was the best size for the diffusion of heat, and for giving the greatest amount of heat from the smallest quantity of coal.

Brickwork, Walls, &c.

In the arrangement of the brickwork, walls, &c., the principle to be observed is to obtain the greatest possible strength to the setting with the least possible quantity of brickwork covering the surface of the retorts. The front wall is 9 inches thick; the partition wall, which is 5 feet 7 inches from the front wall, is also 9 inches thick; and the centre wall, where the retorts are joined, is the same. Then there are three walls at equal distances between the partition and front walls, each 4½ inches thick, with openings for the proper diffusion of heat. This comprises the whole of the brickwork above the furnace, except where, at two or three points, the retorts are strengthened as shown in the drawings. I have seen it recommended that the front wall should be 14 inches thick, but this prevents the heat getting to to the front of the retorts, and where there is always a large quantity of coal in shovel charging, the result is a loss in the carbonizing power. I think in the arrangement I have described there is sufficient strength of brickwork with the least possible covering over the retorts.

Construction of Furnaces.

In the construction of a furnace it is necessary, in the first place, to ascertain what size it should be, in order to raise the quantity of heat required; and, in the second place, to make arrangements for a proper supply of air, and for the proper mixture of that air with the furnace gases, so that, as nearly as possible, every atom of the latter may have its due equivalent of oxygen. Of course, the nearer this is obtained the more perfect will be the combustion. If a furnace is too large, and the coal capacity too great, there is, undoubtedly, a waste of fuel; while, on the other hand, if the furnace is too small, you cannot raise the required heat. I have tried various sizes of furnaces, and find that the one I have adopted with this setting is that which gives the greatest quantity of heat with the smallest quantity of fuel. The dimensions are as follow:—The width at the fire-bar is 5½ inches. It is then splayed out to 14 inches to the springing of the arch; the height from the fire-bar to the crown of the arch is 1 foot 10½ inches; the arch is struck from a radius of 9 inches, and is made with two rims, as shown on drawing. You will also observe that the arch sets back on the walls of the furnace 2 inches on each side. This, I think, adds greatly to its strength, by protecting the foot of the arch from the heat of the furnace. The air space is as follows:—When the 2-inch furnace-bar is deducted from the opening, it leaves a space 3½ inches wide; the length of the air space is 2 feet 8 inches. This gives 112 inches, a supply which would be totally inadequate to raise the heat required if we had not a supply of hot air around the top of the furnace. This air is supplied, through 10 openings, in thin streams, so that we not only get a quantity of hot air to enter into chemical combination with the furnace gases on the top of the furnace, but, being supplied in thin streams, it is diffused and more effectually mixed with the gases, causing more perfect combustion than could otherwise be obtained. This air is supplied by the following arrangement. There are two chambers on each side of the furnace, as shown in the drawing, and the air is taken into the lower of these chambers at the front of the retort-bed. It passes to the end of the furnace, and is then directed to the upper chamber, whence it passes into the furnace. The current, in its progress from its entrance, at the front of the retort-bed, to the furnace, abstracts the heat from the sides, and becomes sufficiently heated to enter at once into chemical action with the carbonic oxide, or any of the furnace gases with which it combines. I will just add to this that the furnace I have described is the least I have ever seen or known applied to a setting of eight retorts; but the fact was that the furnaces which were in use, previous to this being adopted, had such a large coal-swallowing capacity and waste of fuel, that the opposite system was initiated with the best results.

Chemical Reactions.

The compounds into which coal is resolved when heat is applied all require their proper equivalents of the above-named form of energy in order to obtain from them their maximum thermal effects. To secure this, a supply of air must be provided in addition to that which is drawn through the furnace-bars, and the finer the supply of air is, which is brought in contact with the gaseous products of the coal, the more complete will be the combustion. From a consideration of the chemical changes which take place in the furnace during the burning of the coal, it is evident that there must be a supply of air at the top of the furnace as well as at the fire-bars. These chemical changes or reactions may be seen to be as follows:—When fresh coal is thrown upon a hot fire, it at once begins to undergo decomposition, a number of compounds of carbon with hydrogen being abundantly evolved in a gaseous form; some of these hydrocarbons are immediately inflamed, burning with a bright light, though a large proportion of them, on coming in contact with the glowing cokes, are, to a greater or lesser extent, dissociated—that is, the carbon and hydrogen are separated; the latter, the more combustible element, burning if there is a sufficient quantity of air. Should there be an inadequate supply of air, the hydrogen passes off in a gaseous form, and the separated particles of carbon are carried by the heated gases into the flues, and deposited there in the shape of soot. In order to remedy these effects of imperfect combustion, and to obtain from a given weight of coal its maximum quantity of heat, we pass over the top of our furnace (as shown in the drawings) a fine stream of air. The oxygen constituent combines with the unburnt atoms of hydrogen (if any), forming by their combustion the vapour of water, thus: $H_2 + O = H_2O$. The hot particles of dissociated carbon also unite with the atmospheric oxygen, which, by their combustion yield carbonic acid ($C + O_2 = CO_2$). We thus obtain, by admitting air on the top of our furnace in small quantities, heat which would be otherwise entirely lost. Further than this, the air which comes in contact with the burning coal at the fire-bars is converted by combustion into carbonic acid. This in passing over the glowing coke, higher up the furnace, suffers dissociation, becoming carbonic oxide:—Thus, $C + O_2 = CO_2$; $CO_2 + C = 2CO$. This carbonic oxide before it quits the furnace is again turned into carbonic acid, developing in the process considerable heat. Let us then look at the total effect we may produce by the combustion of these gases. For every unit weight of hydrogen which we burn we obtain, with oxygen, its caloric equivalent, a quantity of heat which would raise 34,462 times that weight of water 1° Fahr.; likewise, when we burn carbonic oxide with its equivalent of oxygen, we get as the calorific equivalent 33,642. So with marsh and olefiant gases we get numbers between 26,000 and 28,000. The merest glance at these figures is sufficient to prove that the combustion of these gases contributes enormously to the very high temperature and the quantity of heat obtained, in the furnace connected with this setting of retorts. I may say also that in these furnaces a good draught is required. The strength of the draught has a great deal to do with economizing fuel because the stonger the draught and the greater the evaporating power of the coal, the greater is the intensity of the fire, the more completely are the gases consumed, and the more perfect is the combustion.

The Results of Four Years Working.

The following figures will show the results obtained in the working of this setting of retorts for four years. The average quantity of coal used in the furnaces has been 21 per cent. of the coal carbonized; the average quantity during the three previous years to this setting being adopted was 39 per cent. We have thus had a saving of 18 per cent., which for the four years equals 9000 tons of coal. It may be said that 21 per cent. is nothing very extraordinary, when we consider that some engineers are working coke furnaces with 15 per cent.; but this must also be considered, that although there is an equal amount of heat given by burning a ton of good coal and a ton of coke, a proper combustion of the former is more difficult to obtain. It may be thought that the fuel account might be shown to better advantage at the expense of the coke, and I therefore give you the quantity of coke sold per ton of coal carbonized during the last four years. It was 13½ cwt.; the coke sold per ton of coal during the previous three years was 13 cwt., and during the last four years was of a similar price to that which was used during the previous three years.

In conclusion, I may say that I do not know of any gas-works where coal is used as fuel, in which the fuel account is as low as our own; also that the system is applicable to the settings of any number of retorts. I have settings of fives, sixes, sevens, and eights, and if all our retort-benches would admit of eights, and we could have "throughs," I should not hesitate to say that the fuel account would be reduced to 15 per cent. of the coal carbonized.

Mr. Cleland (Liverpool) said he understood from Mr. Anderson's paper that he did not use through retorts; he certainly said nothing about them. He thought this was a very important feature as affecting the economy of fuel. Working with single retorts—any 9 feet long—there was a waste of heat at the back, which might be saved by lengthening them and firing at each end. These through retorts offered great facility for the removal of carbon, which again led to economy. With respect to the use of hot coke, it was very attractive, and he had tried it to a considerable extent, but had to give it up at last. It seemed very strange to say that the same quantity of coke, slaked with, perhaps, 10 or 20 per cent. of water, would do more work in the retorts than could be done with the use of hot coke, but so it was. The water in the coke was by no means useless as a source of heat. It was decomposed, and gave up its carbon, which was consumed in the upper part of the retort, and so the moisture became a kind of fuel. He gave up the use of hot coke, and returned to the use of ordinary coke on this account. Mr. Tindall, in his paper, recommended that the furnace should be supplied with hot air, heated by passing between the furnace and the flue under the retort, returning again to the front, and so passing through the nostrils into the furnace above the fuel. The idea, he believed, was originally Mr. Lowe's, and on the suggestion being made, he (Mr. Cleland) tried it a good many years ago, but he was very disappointed with the result. And the reason was this. It was a good thing, no doubt, to supply the furnace with hot air, provided that, in heating the air, they were not "robbing Peter to pay Paul." Where was the heat obtained from? From the furnace itself. To supply hot air economically, they must heat it with the heat which had already done all its work, and had become of no more use to the gas maker. It must be taken from some part of the flue after it had heated the retorts, otherwise the gain from that arrangement must be more apparent than real. Again, in the quantity of fuel saved by this setting, it did not seem to him to be so much more than was to be obtained with a setting of seven all through retorts. The best setting he had had was a setting of six D retorts, 20 feet long, heated with a furnace at both ends, the end space being heated with the direct heat of the furnace. With regard to settings of clay and iron retorts together, he thought Mr. Anderson's principle was exceedingly sound. There was not the least doubt that they were losing a great deal of heat in many of their arrangements which might be usefully economised. With heat passing so rapidly through, they could effect in that way what they could not effect with a slow-conducting material like fire-brick. He was rather surprised that Mr. Anderson's system was not more adopted than it had been.

Mr. Key (Accrington) wished to put a few questions to Mr. Anderson, to whose paper he had listened with great pleasure, as also to that of Mr. Tindall. The first one was descriptive of the author's design, but did not give any practical figures to show what results had been obtained from it. The second gave a statement of facts, which led him to open his eyes with regard to the large profits realized. Mr. Anderson spoke of having the mouthpieces fixed on a quarter of an inch above the level of the retort bottom. With such an arrangement, it appeared to him there would be considerable difficulty in drawing the retorts, and great danger of experiencing such a jerk as would slacken the mouthpiece. Mr. Anderson also spoke about having a rise in the crown of his arch of 2 inches in longitudinal section. This plan he (Mr. Key) had adopted for the last six or seven years. He understood Mr. Anderson to say that he used only ovals and rounds in the clay, and D-shaped in iron retorts. He would like to ask why Mr. Anderson had not employed D-shaped clays. He himself had a system of retort-setting, in which he put his fire as close to the crown as possible, the doorway being about 3 or 4 inches from the level of the floor. The heat passed under the bottom of the retorts, and, by an arrangement of flues and dampers, he was able to secure that the front and back of the retorts was equally heated. He could also arrange them in such a manner that, if the bottom retort heated too fast he could check it, thereby equalizing the heat from top to bottom, and from front to back. Mr. Anderson made a good suggestion with reference to sloping the floor of the house towards the face of the retorts. Such a plan not only facilitated the drawing, and raised the men up to the level of the retorts, but, in throwing the shovel, the inclination of the floor gave an impetus to the action, and the man was able to charge more easily. Five years ago, in laying a retort-house floor, he (Mr. Key) gave it a fall of about 8 inches in 10 feet. In Mr. Anderson's drawing he thought there was a loss of space in the arrangement of the retorts in the oven; they appeared to him to be detached and separated, and a good deal of floor-room taken up. The main flue, he observed, was put on the top of the bench, between the two settings of retorts. He would like to ask Mr. Anderson whether it would not be more advisable to keep down the flue as near to the centre of the arch as possible, so as to help to maintain the heat in the inside of the oven. It would help the velocity of the draught to the main chimney.

Mr. WATSON (Sydenham) remarked that the subject dealt with in the papers was a highly important one, because it was from the retort-house that shareholders derived their profits. He wished to ask for information as to how much gas Mr. Anderson produced per ton of coal by his process; what was the make of gas per mouthpiece; and the amount of fuel used—assuming a chaldron of coke to be 36 bushels—and also the size of the retorts.

Mr. LIVESEY said the gentlemen who had read the papers had gone so thoroughly into the subject with which they dealt, that they had left little for others to remark upon. Mr. Anderson put it that the advantage of having a lofty furnace was that the men could more readily repair the retorts. He would like to ask whether there was not another advantage, that with a high-arched furnace they would get a more complete and perfect combustion of fuel. As to the kind of retorts used by Mr. Anderson, he saw that rounds and ovals were much more in favour than D's. He did not agree with him in this, and preferred D's on this ground, that he could could get a much more even layer of coal on a flat bottom than was possible on an oval or a round. There might be advantages possessed by the two latter, which did not belong to D's, but the reason just mentioned was that which influenced his judgment; and using, as he did, retorts entirely of brick, he was shut out from the use of any other form. Mr. Anderson spoke about short men being the strongest and best; they certainly would find it difficult to draw coke out of retorts sloping to the centre. In order to provide against the tendency of the retorts to settle down in the middle, they should have a camber of three inches, so that the retort was that additional height in the middle, to what it was at the mouthpiece. This facilitated the drawing considerably. He granted that the tar in the mouthpiece was a great disadvantage, because it had to be raked out into pans and disposed of; but he greatly doubted whether, as Mr. Anderson remarked in his arrangement, it was really converted into gas. He remembered hearing Dr. Letheby say that no doubt the constituents of gas were in the tar; but instead of getting those constituents in the form of tar, they should endeavour to convert them at once into gas, for when once they began to take the form of tar, it was very difficult to bring them into gas. As to the use of hot air, he entirely agreed with Mr. Cleland that they were abstracting the heat from the furnace by having the chambers at the side. The advantage claimed for the arrangement was that it kept the sides of the furnace cool, and prevented them burning out so rapidly. That there was an excess of heat in the furnace which could well be spared, there could be no doubt. There had been other plans tried in the direction to which Mr. Cleland pointed, by bringing the air to feed the furnace through the flues in which the heated gas, after having done its work, was carried up to the chimney. But the disadvantage was that, by bringing this heated air into the furnace, such an intense heat was produced that it melted everything. He had seen such a furnace as Mr. Anderson described, without any fire-bar, at the Chartered works, and he observed that at the bottom, where hot air entered, it was at a white heat. When in Paris last year he saw a method of admitting air at the sides and top of the furnace in the gas-works at Vaugirard, and he was bound to say he had never met with a better method. The engineer there built up the front of his bed, and enclosed the mouthpieces in brickwork. On inquiring whether he ever had stopped pipes, he was informed that no extra trouble in that direction was experienced. Round the sides and arch of the furnace he had four 1-inch pipes just admitting a little stream of cold air, and the engineer stated that the cold air thus entering assisted to convert the carbonic oxide into acid, and prevented the brickwork from burning away so rapidly.

Mr. PATERSON (Cheltenham) said it occurred to him, in reference to Mr. Anderson's paper, that the question of making gas in retorts was altogether lost sight of. It seemed to be a question of getting heat into the retorts with as small an amount of fuel as possible. He thought it very questionable if those small per centages of fuel resulted in the same quantity of gas per ton of coal being produced. Some companies, he knew, were using very small per centages of fuel, and yet appeared to get good returns; but he was quite sure that if they used 10 or even 25 per cent. more fuel, the commercial results would be such an increased quantity of gas as to make the addition desirable. There seemed to be now no proportion between the price of gas and coke, and if engineers, by an increased per centage of fuel, could make 1000 feet more gas per ton than they did at present, they would be more than compensated. His experience during the last year convinced him of that. At Cheltenham they had in use the system of retorts introduced by the late Mr. Spinney, and the results were very favourable. During the last year he had used nearly 60 per cent. of fuel, but the consequence was that he sold not far short of 10,000 cubic feet of gas per ton of coal carbonized. He had no doubt that if he had reduced the fuel 25 per cent., he would have lost more money than he gained. The points brought out by Mr. Watson went to the very root of this subject. It was not a question of making fuel so much as of obtaining the greatest quantity of gas per ton of coal. Mr. Livesey hinted at a matter which had engaged much of his attention—*i. e.*, the question whether they could make the tar into gas; but he thought that if they raised such a heat in their ovens or retorts as would not allow the tar to form at all, but converted it into permanent gas, the results of their working would be quite as favourable as if they effected a great reduction in the amount of fuel consumed. He threw out these hints because he had had to work under very trying circumstances, and his experience had proved to him that the monetary position of a company did not so much depend upon the fuel account as upon the greatest production of gas per ton of coal.

Mr. FRASER (Inverkeithing) said the high price of coal two years ago had been of advantage in some quarters, inasmuch as it had made people think how they could get the greatest return out of that material. Even now, he believed, the southern men had not altogether discovered the best means of getting the most out of their coal; it was desirable, therefore, that practical minds should be directed to the subject. Mr. Anderson said something about the form of retorts, which did not reach his ears, but he might say generally that he thought the form had something to do in the matter. He scarcely agreed with Mr. Livesey that the D shape was the best, but was inclined to regard the circulars and ovals as superior. One reason for this was, that with the two latter the fire played more completely round them. In the next place, the circular form gave the smallest quantity of material for the area, and therefore the cubical contents were greater. It would be highly desirable if the members of the association could come to a conclusion as to really what was the best form. When he first entered upon the business, his customers were obliged to take the form he gave them; but times had altered, and he had now to make retorts to suit every capacity. But he still thought it would be an advantage if gas managers could determine what shape was best.

Mr. ANDERSON, in closing the discussion, said the first thing on which he had to remark was the inquiry about through retorts. He had not said a word about them; he had no objection to them, but he did not use them because his works were not large enough to employ them economically. The next thing was as to the form of retorts, whether ovals or circulars. His only reason for using them in preference to D's in clay was, that he found the latter were not so lasting—they were liable to break at the corners. A D retort had necessarily a portion through the arch much thicker than the other part, and, from whatever cause, he found that they were more liable to crack. They were also more difficult to repair if a piece fell out of the bottom. As to his iron retorts, they looked like D's, but they were retorts with a 3-inch radius in the corner, a form he first had cast at the Surrey Gas-Works. He found that it took a man three times as long to draw an iron retort as a clay, and that the coke was much smaller, through the necessary pulling and hauling to get it out, and the stuff in the barrow was like breeze, whereas a man now brought out the whole mass from a circular or oval just like a sausage. He had looked at the thing with a view to economy, and also to the ease of the men. At the same time he thought with Mr. Livesey that theoretically the D was the best shape, because the coal was spread more evenly, but they sometimes found in round retorts a dull piece in the centre not thoroughly carbonized. Practically, he found that, all things considered, the oval retort was better than any other in form. As to the removal of the carbon, not having through retorts, he need not refer to the facilities they presented for the purpose; but he might remark that he believed the formation of carbon arose, to a large extent, from certain blunders in the mode of setting retorts, and in the charging of them. With reference to the use of hot coke, he would say, let those who chose to do so put water into their furnaces; but, for his own part, he did not think they were likely to succeed in heating their retorts in that way. He preferred the direct mode of action to any decomposing process. It had been objected that in speaking of his mode of setting he had not given results. He ventured to say that he had given a statement from which results might easily be taken. He stated that he could heat his retorts to any temperature he chose, and what more was wanted? Whether he made 1000 or 10,000 feet per mouthpiece was not material to the question if, as he stated, he could heat his retorts to any degree, even to the melting point. Reference had been made to dampers. He was in favour of them when young; but he had seen the danger of them in the hands of stokers, and thought that if they could be dispensed with the better. He had been asked about the quantity of gas produced per ton. He did not like to make above 9500 feet, and did not believe that to go beyond was any benefit to the producer. To make 9500 feet per ton of 14-candle gas was to do as much as could economically be done. To go much beyond this the retorts must be kept much longer in action—weak, dirty gas was produced, illuminating power was diminished, fuel wasted and labour increased. He agreed with Mr. Livesey as to lofty furnaces. He liked them because they secured better combustion, and the combination of the oxygen of the air with the gases from the fuel in the production of heat took place best in an open space. If the furnace was low it had to pass with great velocity, the effect being to burn away the brickwork; whereas, if they could get the same result in an open space, they got it without that destruction. The only thing in which he differed with Mr. Livesey was with reference to the falling away of the retorts. He would do the same thing as Mr. Livesey proposed if he found his retorts sink, but he did not—in fact, that was one of the evils of through retorts. He had known them to sink so much that one could hardly see through them. But, by having first-class work, and with retorts 9 or 10 feet long only, he never found any sinking. His reason for giving a back fall to them was to avoid having smoke during charging. Whether the tar could be converted into gas was a moot question, and, being so, he would take the benefit of the doubt, and say that he did it.

Mr. TINDALL said he was very pleased that his paper had contributed to the discussion, although, had he known that Mr. Anderson was writing on the same subject, he should not have followed on that side. The only remark he would make had reference to what had been said as to hot air. That system could not be applied except with coal furnaces. In his own case, it had been attended with very good results.

The PRESIDENT said he had no observations to make upon the interesting papers just read. The subject had been very freely gone over. The important points brought forward by Mr. Anderson were worthy of very mature consideration, because they involved, to a large extent, the profit which, if not gained in the retort-house, could not be realized out of it. There could be no doubt that it was in the construction and arrangement and heating of the retorts that the success or non-success of their operations to a large extent lay, and there could also be no doubt that in the economy of the heating of retorts was involved a question of most material importance. He quite concurred in the observations made by Mr. Anderson in his paper, and also in the discussion that followed. The importance of reducing the amount of fuel to a minimum, while producing the maximum results, was generally recognized, but the consumption of fuel might be limited too far. It might be limited to the disadvantage of the company in the production of gas. This was an important consideration, which must always be kept before the mind of the manager, while, on the other hand, he must not lose sight of the duty of getting the full amount of gas out of his coal. Mr. Anderson thought that 9400 or 9500 cubic feet of gas per ton was a production with which they ought to be satisfied. It might perhaps be considered a very fair rate from ordinary coal, but, when manipulating with coal of a superior quality, and especially when employing a mixture of cannel, that could hardly be considered a proper quantity to take out. Supposing the illuminating power to be 16 candles, and the coal of a fair quality, with about 25 per cent. of cannel, there ought to be a production of about 10,500 feet per ton, and, if that result could not be realized, there must be something amiss in the construction, or in the working. With regard to hot air, that was a question upon which he was much inclined to adopt the views expressed by Mr. Cleland. He confessed that he had not found much benefit from it, nor from having a very large area of furnace. It was not really required for furnace purposes, and for the combustion of the fuel he believed the air should chiefly be admitted through the gratings rather than over the surface. The latter might to some extent tend to the combustion of the carbonic oxide, but the better mode of working was to prevent the formation of it. There could be no doubt that "the economy of force" and energy in any method of gas manufacture was an element they must always keep in mind as of vital importance.

(To be continued.)

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is no change worthy of note in the general aspect of business; the announcement of the recent heavy failures has necessarily had rather a depressing influence on the trade, though, so far, this district has suffered very slightly by the startling collapses of the last few weeks; and the trade, though certainly very depressed, is generally believed to be in a moderately healthy condition. Business, however, is very unremunerative, and should this state of things continue much longer, it is not improbable that some of the weaker houses may succumb; indeed, there are already unpleasant rumours afloat touching several Black Country firms. Business continues to be conducted with great caution, and transactions are on a very limited scale, the export trade is very quiet, excepting for galvanized roofing-sheets, for which there is still a steady inquiry, on account of the colonial and South American markets! Unmarked bars may still be had at £8 7s. 6d. per ton, but at that price they are not now so freely offered as was the case a few weeks ago.

In pig iron the market continues steady. Hot-blast native all-mine is quoted £5 to £5 5s.; cold-blast ditto, £6 10s.; and cinder pig, £3. The local consumption of foundry iron is unusually heavy, and pig makers are mainly depending upon this for support. The demand for gas and water mains, general machine castings, and such like heavy produce, continues to give full employment to the ironfoundries of the district, and consumers complain loudly of the delay in the execution of their orders.

The wages question in the iron trade remains unsettled. A meeting of the South Staffordshire Conciliation Board will be held shortly to adjudicate in the matter, but it is not thought probable that any important reduction will be made.

The coal market rules dull, supplies are everywhere abundant, and prices have a somewhat easier tendency.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Trade remains quiet, despite the lower prices of pig iron and of some descriptions of fuel. These reductions are, as yet, certainly of no great extent, but they serve to indicate the course matters are taking, and are of themselves welcome to the producers of all kinds of finished goods.

The following are the current quotations of agents for Cleveland firms, general makers brands:—No. 1 foundry, 59s.; No. 2 foundry, 56s.; No. 3 foundry, 53s.; No. 4 foundry, 52s.; No. 4 forge, grey, 51s.; No. 5 forge, mottled, 50s.; No. 6 white, 49s.; refined metal, 71s.; Kentledge, 62s.; and cinder pig, 42s., all per ton for net cash at the works or in railway waggons.

Most of the leading foundries are still well employed in the manner recently indicated in these notes.

There is no noteworthy alteration in the prices of either coke or coal.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

The heavy failures which during the past week have occurred in this district, although, except in one instance—that of Messrs. Walter Mabon and Co., a firm of long standing and respectability—not directly connected with the iron or coal trades, have caused an increased amount of caution in business generally, and tended still further to depress the market here. In the Manchester market the coal trade is very quiet, with a sensible accumulation of stocks; and, although the local list rates are still maintained by the leading firms, there is a good deal of underselling in outside sales. In the districts which are partially supplied from the Manchester market there is a good deal of competition, and the colliery proprietors in the neighbourhood of Oldham have in contemplation a reduction of the local pit prices, which will probably be decided upon this week.

In the West Lancashire districts trade continues exceedingly quiet, with supplies very much in excess of the demand, the great irregularity in prices being an inducement to consumers to buy only for their immediate requirements. Quotations at present are of little real value, as neither buyers nor sellers are guided by the list rates in the case of large purchases.

There has been a little more inquiry for coasting shipments, but the foreign trade continues to fall off very considerably, and common classes of coal are offering in Liverpool at very low rates.

In the gas coal trade prices now seem to have reached their lowest point, and there has been rather a pressure on the part of consumers for tenders. Wigan four-feet, although not what may be strictly termed recognized gas coal, like the Arley Mines, is still largely used for this purpose, and the lowest quotations which colliery proprietors seem prepared to offer for this class of coal, screened at the pit mouth, is about 11s. per ton. Cannel, which is now being gradually worked out in the Wigan district, fully maintains late rates.

The coke trade is quiet, but there is no material alteration in prices.

The wages question promises soon to come definitely to the front. Some of the colliery proprietors are anxiously putting forward the necessity of a reduction, but there is scarcely yet sufficient unanimity for any general action.

The iron trade continues very flat, and there is scarcely anything doing. There is plenty of underselling in the market, but even at reduced rates buyers are not to be found. No. 3 foundry, Middlesbrough pig iron, delivered in this district, is quoted at 61s. 3d.; No. 4, 60s. 6d.; and No. 4 forge, 60s. per ton. Puddled bars are worth about £6 14s. 6d. per ton; ordinary crown bars, £8 10s.; heavy rails, £7 12s. 6d.; and light ditto, £7 17s. 6d. per ton delivered.

The works are not very well covered for orders, and some of them are not working full time. Amongst founders there is a pretty good demand for builders work, but ordinary castings are not much inquired for.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

During the past fortnight the coal trade of the North of England has been in a somewhat dull state. The demand has fallen off, especially for second-class sorts, and the general position of the gas coal trade is a trifle weaker. Second-class collieries have been very anxious to trade at prices, where business was intended, to suit buyers. Household coals have been flat, and at present rates second-class household sorts hardly pay the collieries. Steam coals are also lower. In the freight market there are very few orders for the coast, and rates have been falling a little during the past three weeks. In the general manufacturing trade there is a fair demand for fire-clay goods and chemicals, but nothing very particular. The present financial crisis in London is causing merchants and manufacturers to act with great caution, and it has, of course, put an end to all speculation for the moment. In fact, the trade that is doing is to supply immediate wants. The continental trade is not very good, and at present very little timber is being imported from the Baltic, merchants in that sea having suffered very severely from the losses caused by the depression of the timber trade last autumn.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

I am glad to be able to state that reductions in the price of gas still continue to be announced throughout Scotland. At Milngavie, a small town lying several miles north of Glasgow, a reduction from 8s. 4d. to 6s. 8d. has been made, and the dividend of 8 per cent. for the year ending the 15th of May has been declared. The Dunoon Gas Company held their annual meeting last Saturday, when the directors submitted a report of the past year's transactions, and recommended a dividend of 10 per cent., and the reduction of the price of gas 10d. per 1000 feet. Both recommendations were approved of. Acting, as usual, in harmony, the Edinburgh Gaslight Company and the Edinburgh and Leith Gaslight Company have both announced a reduction from 5s. 8d. to 4s. 10d. per 1000 feet, the scale of discounts and meter-rents remaining as hitherto. At their last monthly meeting the Police Commissioners of Broughty Ferry, on the Tay, approved of a recommendation from the Gas Committee that the price of gas should be reduced 10d. per 1000 feet, making it 5s. 10d. within the burgh, and 6s. 3d. outside. The Kirkintilloch Gas Company, at their seventh annual meeting held last Thursday, resolved to reduce the price of gas from 6s. 3d. to 5s. 10d. per 1000 feet, and should the half-yearly balance in December be favourable, to make a further reduction of 5d. per 1000 feet. A dividend of 8 per cent. was declared, while the sum of £167 13s. 8d. was carried to the reserve-fund, which now amounts to nearly £900. In order to increase the powers of distribution to Lenzie and Woodilee Asylum, it was resolved to issue 200 £5 shares, to be offered to the present shareholders at £7, or £2 premium. On Monday, the 14th inst., the Perth Corporation Gas Commissioners held their annual meeting, when it was announced that the price of gas would be reduced to 5s. 5d. per 1000 feet, as against 7s. 1d. last year, being a reduction of 1s. 8d. per 1000 feet. On the following day the Dundee Corporation Gas Commissioners also held their annual meeting, and considered the statement of accounts for the past year, and the estimated revenue and expenditure for the current year. The proposal to reduce the price of gas to 5s. per 1000 feet, less 5 per cent. if paid within 28 days (making the price virtually 4s. 9d.) was approved of. Much praise was bestowed upon Mr. M'Crae for his most successful management of the works, and many interesting facts were mentioned, in the course of the proceedings, regarding the progress and improvements of the works.

The annual general meeting of the gas company of Auchinleck, Ayrshire, was held last Wednesday evening, when a dividend of 5 per cent. was declared, a balance of £21 13s. 2d. being carried to the reserve-fund. It would seem that the new gas company formed recently at Helensburgh is not going to be "snuffed out of existence" by the great reduction in the price of gas already announced by the old company. An advertisement has just appeared in the local papers requesting that the applications for shares (10,000 at £1 each), accompanied by a deposit of 5s. per share, be lodged forthwith.

At the usual meeting of the Glasgow Water Committee last Monday, the engineer reported that on the 7th inst. the quantity of water in store was as follows:—In loch, 122 days supply; in Mugdock reservoir, 18 days; in Gorbals reservoirs, 121 days, and that the quantity of water sent into the city and suburbs during last fortnight averaged 36,150,000 gallons per day. On the same date the treasurer reported the revenue stood thus:—1874-75, £117,669 4s. 2½d.; 1873-74, £111,023 3s. 0½d.—difference, £6646 1s. 2d. A special meeting of the same committee was held on Friday, to consider the subject of the revenue and expenditure for the year 1875-76. A motion was formally proposed and seconded for reducing the domestic rate to 6d. per pound on rental, and the outside rate to 9d. After some discussion it was unanimously resolved to adjourn the meeting for the further consideration of the motion.

An ordinary meeting of the Dundee Water Commissioners was held last Saturday, when the treasurer submitted the year's accounts. There was a surplus to the credit of the commissioners of £5458 11s. 2½d., the net revenue being £28,415 12s. 11d., as against £27,429 17s. 1d. for the previous year. After some conversation, it was remitted to the Finance Committee to prepare the estimates of revenue and expenditure for the ensuing year.

The work of bringing a new supply of water to the town of Dalry is progressing very rapidly, owing to the favourable condition of the weather. The pipes are now being laid through the streets, and the different connexions formed, so that before the lapse of many months the town will have a good supply of excellent water. Messrs. Leslie, engineers, Edinburgh, have just devised a water supply scheme for the town of Kirkwall, in the Orkneys. The Rothesay Town Council are considering the proposal to buy up the plant, &c., of the Rothesay Water Company, at a cost of £22,500. Tenders for the new works connected with the Gourock water supply are now being solicited, and the new works at Trinity Muir, for the town of Brechin, have just been finished, and Mr. Gale, C.E., Glasgow, is about to go over and inspect them preparatory to their being formally taken over from the contractor by the commissioners.

Pig-iron warrants have generally ranged at rather over 58s. per ton during the past week. On Friday a few thousand tons were done at 58s. 3d., one month fixed, and 58s. cash. In the afternoon, sellers asked 58s. 9d., buyers offering 58s. 6d. cash.

The price of coal is practically unchanged, but a good deal more business has been done during the past week. The rates seem now to have arrived at the lowest point.

BIRMINGHAM WATER SUPPLY.—Dr. Hill, the medical officer of health for Birmingham, reports that the water supplied to that town in May was "slightly turbid from small particles, numerous moving animal organisms, some visible to the naked eye, and many vegetable growths."

GLASGOW WATER SUPPLY.—Professor Bischof, of the Andersonian University, Glasgow, reports that the water supply of that city during May, although yellowish, was almost clear, and was "quite free from evidence of previous sewage or animal contamination."

EDINBURGH TOWN COUNCIL AND THE GAS SUPPLY (SCOTLAND) BILL.—At a meeting of the Edinburgh Town Council, held on Wednesday the 9th inst., a report was brought from the Lord Provost's Committee, recommending that no action be taken with reference to the Burghs and Populous Places (Scotland) Gas Supply Bill. Mr. Mossman moved that the council petition in favour of the bill. The Convention of Royal Burghs had agreed unanimously to do so, and a great number of the burghs throughout the country had also done the same. The Lord Provost said the bill was intended for small places, and not for cities of the magnitude of Edinburgh. An Act of their own would be required before they could take over the gas-works. Mr. Mossman said that large towns in England and Scotland had taken the supply of gas into their own hands, and the result was that they were able to sell the gas far cheaper and of purer quality, while the profits realized from this source were devoted to public purposes. In Edinburgh the two gas companies had a complete monopoly; they could charge what price they liked, and they could give what quality of gas they liked. Last winter the gas supplied by them was very obnoxious, and its effects had been very serious. On the motion being seconded and supported, Convener Robertson supported the committee's recommendation, that the council take no action. He referred to the meter question as a warning to the corporation not to have anything to do with such undertakings. When the water was taken over by the council, it was said that it would be a great boon, but he was of opinion that it would have been much better had it been left in the hands of the old company. Mr. Mossman was one of the water prophets, but the result of his prophecy he had not seen realized; and he (the convener) trusted they would not attempt another experiment of that kind. Mr. Mossman replied that the water was now cheaper and better distributed than formerly. Mr. Durham said that when Glasgow applied to take over the gas-works, they had to pay a capital sum which yielded 9 per cent.; and he thought the city of Edinburgh should not entertain the idea of buying up the interests of the parties in these profitable concerns. Mr. Cranston spoke of the importance of such a bill being passed; and in reference to a remark by the convener, he stated that, while the old water company charged 8d., the corporation were now selling water at 6d. Treasurer Colston said that the bill had not the slightest chance of passing, and they were wasting time in its discussion. He wished, in connexion with the subject, to call the attention of the convener of the Cleaning and Lighting Committee to the fact that they had just paid £4000 to the Edinburgh Gas Company for the gas used in lighting the streets. He thought that was too much by at least £500. The price of gas was raised when the coals increased in price, but it had not fallen in proportion to the fall in the price of coals, and a handsome sum was now realized for coal tar, which the gas companies had formerly to pay people to take away. In these circumstances he thought the Lighting Committee should make a representation to the gas company on the subject. After some further discussion, it was agreed to petition in favour of the bill—two members of council dissenting.

Register of New Patents.

2847.—RUSS, B., Little Ilford, Essex, "*Improvements in the manufacture of gas and in the apparatus connected therewith.*" Provisional protection only obtained. Dated Aug. 18, 1874.

The improvements comprised in this invention are founded upon patent No. 1924, dated June 29, 1872.

By the present improvements the coal is distilled in retorts, in the manner now usually adopted in all gas-works, in which the distillation of coal is carried on for the purpose of manufacturing illuminating gas. The hydrocarbon vapour passes upward from the retorts into a main, occupying nearly the same position as the ordinary hydraulic main, except that in this case no water is used. From, this main the vapour passes downward by two pipes into two cylinders placed

above the retorts, and heated from the same furnace. These cylinders or purifiers are filled with lump-lime. Between these cylinders, and slightly above their level, is a third cylinder of the same size as the other two, and filled with pieces of fir, pine, or other resinous woods. In order to prevent this wood from being carbonized too quickly, a small quantity of steam is injected into the cylinder from time to time. The products of combustion given off from this cylinder pass upwards into the main referred to, and mix with the vapour from the retorts. The mixture of gases from the top cylinder, and the vapour from the retorts contained in the main, then pass downwards into two lower cylinders or purifiers throughout the whole length of the cylinders, and finally escape upwards (by the pipes placed at their opposite ends) into another main similar to that described. In this main is fixed an apparatus which combines the function of agitator and exhauster. By revolving at a high rate of speed, it agitates and thoroughly mixes the gases; and at the same time it exhausts and creates a partial vacuum in the cylinders and pipes, and thereby contributes to a more perfect circulation of the gases contained in the apparatus. From the agitator placed in the second main, the gases are forced downwards through a pipe into a chamber placed over a fire (so as to keep up, as nearly as possible, the same temperature as that in the cylinder—viz., about 1200° Fahr.), and having on its upper side a grating through which the gas may pass upwards into an upright cylinder. This chamber contains a damper, which may be raised and lowered by any suitable arrangement, so as to prevent the gas escaping too quickly from the chamber. The upright cylinder, placed above the chamber, is filled with lime, breeze, iron turnings, and charcoal, and through these materials the gas passes upwards through the head of the cylinder, and through a pipe into a small cylindrical chamber contained within a larger one. The inlet-pipe dips about 2 inches below the surface of the water contained within the small cylinder, and the mouth of the outlet-pipe should be placed at any suitable distance above the surface of the water. The larger cylinder is completely filled with water, which constantly runs in through a pipe placed at the bottom of the cylinder, and out through a pipe placed at the top of the cylinder.

From the small cylinder the gas passes through the outlet-pipe above referred to into purifiers of any suitable construction, and thence in the gasholder.

Placed below the uppermost of the three cylinders is a smaller cylinder, about 9 inches in diameter, and heated from the same furnace as the retorts. This cylinder serves as a steam generator and superheater, and is connected by a cross-pipe with the two lower cylinders, and with the upper cylinder by a vertical pipe; it is fed with water by a small cylinder placed above the brickwork of the beds, and containing a coil of pipes, which is supplied with steam from the boiler. Water is forced into the cylinder by means of a hydraulic pump; the coil of pipes being filled with steam will raise the temperature of the water to boiling point, when the water will be made constantly to flow into the generator.

When the steam in the generator has been raised to the requisite amount of pressure, it passes into the three cylinders placed above the retorts, for the purpose of condensing any foreign matters which may pass from the retorts into the cylinders or purifiers. Each time the steam is injected into the two lower cylinders, a very small quantity of vapour of hydrocarbon oil, or other suitable oil or fatty matter, should be injected simultaneously. Suitable slide or other valves are placed in each inlet and outet pipe connected with the retorts and the cylinders.

2878.—Aronson, J. N., Portland Place, London, "*Improvements in lamps or lighting apparatus.*" Patent dated Aug. 21, 1874.

This invention consists in the application to, and combination with, the lamp or lighting apparatus, of a gallery, carrier, or support arranged to be moved up and down and to carry with it the chimney, globe, and shade, or such of these parts as may be in use at the time, so as to enable them or it to be readily moved into and retained in a position permitting of access to the burner by simply raising the moveable gallery, carrier, or support, which may be done by the direct application of the hand of the operator.

2880.—Houghton, J., Salford, Lancs., "*Improvements in the construction of taps or valves.*" Patent dated Aug. 21, 1874.

This invention is applicable to taps or valves to be used for steam, water, or gas, wherein the valve is opened and closed by turning a lever or hand-wheel keyed or fastened to a spindle passing up from the valve-plug, and is designed to do away with stuffing-boxes or artificial packing material hitherto employed to render the same water or steam tight.

2894.—Hulett, D., High Holborn, London, "*Improvements in street and other lamps or lanterns, and in apparatus for regulating the supply of gas thereto, and to other gas-burners.*" Patent dated Aug. 24, 1874.

These improvements in street and other lamps or lanterns consist of simple and effectual means for securing glass panes in the skeleton or frame without the use of putty or cement of any kind; the panes when broken may also be readily removed and replaced.

According to one mode of carrying out the invention, metal flaps or pieces of metal which are capable of being turned over on to the edges of the glass, are hinged to the skeleton or frame of the lamp or lantern, and secured in that position by means of buttons, bolts, screws, or any other suitable fastenings, whereby the pieces of glass are held securely between the hinged pieces and the skeleton or frame. Or in lieu of hinging the pieces of metal to the frame of the lamp angular slots are formed or cut in the metal pieces, and so fitted as to slide over metal studs or projections, somewhat in the manner of a bayonet joint, or the slots may be in the frame, and the studs in the metal pieces. These metal pieces may then be easily slid over the edge of the glass, and thereby hold the glass securely in the frame. The sliding or hinged pieces may be made removable from the frame if desired, but it is preferred to connect them permanently thereto.

The apparatus for regulating the supply of gas to street-lamps and other burners consists of a valve, through which the gas is caused to pass on its way to the burners, the passage of such gas being regulated by raising more or less the valve or diaphragm from off its seat. The valve or diaphragm is attached to one end of a screwed stem, which works in a nut formed in the boss of a pinion fitted to rotate on a collar in the valve. The rotation of this pinion raises or lowers the valve from off or on to its seat. This pinion gears with another pinion, and also with a spur wheel, which work in suitable bearings in the valve box or outer case in which the valve is contained. The pinion on the valve spindle receives motion from another pinion gearing into it, which is rotated by a handle, key, or knob fitted to the axle, or the handle may be fitted directly to the valve pinion. The rotation of the pinion on the valve spindle also imparts motion to the spur wheel, upon the axle of which is fitted a pointer which indicates the position of the valve on a dial attached to the face of the outer case.

2901.—Knowelden, J., Bermondsey, Surrey, "*Improvements in steam, water, or other fluid engines.*" Patent dated Aug. 25, 1874.

These improvements consist of a valve in combination with a central crank-shaft composed of a ring or rings moving freely between two faces of metal, yet sufficiently close to prevent the passage of steam, water, or other pressure fluid.

2911.—Ley, W., and Shearer, G., Liverpool, "*An improved tube-plug or stopper.*" Patent dated Aug. 26, 1874.

The features of novelty which constitute this invention relate to the use of india-rubber, or a combination of india-rubber and asbestos, or other elastic packing, so arranged that when acted upon by the pressure of water or other liquid, or steam, in a tube, the pressure expands the packing, and thereby stops the tube.

2915.—Hill, F. B., Lambeth Road, Southwark, "*Improvements in connecting apparatus for coupling hose and other pipes, and securing covers on pipes and in other situations.*" Patent dated Aug. 26, 1874.

This invention consists in the use on one pipe of an internally screwed ring, which works on a corresponding male thread on such pipe, and has lugs or projections which overlap a faced flange on the other pipe, so as to draw and hold the flanged pipe against that carrying the ring by turning the latter. In the case of covers the lugs overlap the edges of the cover.

2920.—Ramsden, J. C., Halifax, "*Improvements in apparatus to be employed in the manufacture of gas for heating or illuminating purposes.*" Provisional protection only obtained. Dated Aug. 26, 1874.

This invention relates to an improved construction of apparatus, wherein volatile hydrocarbons are employed for imparting increased heating and illuminating properties to gases arising from the combustion of fuel, or for imparting such heating and illuminating properties to aëriform fluids in general.

The apparatus employed consists of a gas-tight vessel having inlet and outlet pipes, within which is a frame carrying a number of rollers (a higher and a lower series); over and under the rollers is a travelling endless web, belt, or sheet, or two or more such sheets, only narrower, leaving passages between for circulation or percolation of gases, may be employed. The rollers have flanges thereon for keeping straight, and even the belts or sheets of woven, felted, or other fabric. A shaft and gear wheels impart rotation to the higher series of rollers; the lower series rotate through the frictional contact of the travelling endless web, belt, or sheet. The shaft referred to is driven by a short shaft introduced through the shell or case of the vessel, an inverted bell trap containing mercury being provided, through which the shaft is passed so as to prevent escape of gas at this point.

On volatile hydrocarbon being supplied to the vessel, and the rollers operated as described, the endless sheet will pass in and out of the spirit, and so the whole surface of the sheet above the surface of the spirit will be evaporating surface in addition to the evaporation surface of the spirit. It will be seen that by the use of such means a comparatively small vessel will give great evaporation, and if requisite dashers or agitators, may be applied to one or more of the rollers immersed in the spirit. Midfeathers applied between the ends of the rollers and the shell of the vessel will prevent the gases of combustion or aëriform fluids passing from the inlet to the outlet-pipes without circulating.

2952.—Lotz, W. F., Carter Lane, London, "*Improvements in the method and means of suspending chandeliers for gas or other lights, and adjusting them to the required height.*" A communication. Patent dated Aug. 29, 1874.

The apparatus constructed according to this invention is as follows:—On the stationary guide or gas-tube hanging from the ceiling a tube is fitted to slide up over it, the lower end supporting the burner-carrier or chandelier; a cross-head attached being connected to the hanging rod or tube by helical springs. Fixed to the upper part of the tube is a tubular and furcated head, between the prongs of which a lever brake is arranged, also pivoted to the prongs; the rod extending through the lever brake. A helical spring is fixed to the brake, and a branch from the head serves to draw down the lever brake so as to cause it to grip or bind upon the rod. To the lever brake is applied an elevator rod, and on pressing it upwards the force of the lever brake spring is overcome, and the grip on the rod relieved; the tube may then slide up and down, and to prevent the lever brake going too high a check is arranged.

Instead of the tube, to which the lamp or burner is affixed, sliding on a solid rod it may have a tube to slide lengthwise with it, and upon such a rod the lever brake apparatus embraces the tube. The tube near its upper end is furnished with a rosette and a tubular neck and clamp screw screwed laterally into the neck. Against the supporting rod on which the neck and tube slide longitudinally, the rod at its upper end is provided with a disc or head, from which projects a male screw and a coupling or tube with a female screw. This enables the pendant to be adapted to rooms of different heights, and it may be either screwed into the ceiling or upon the end of a gas conduit, and the male screw may enter into the pipe.

2978.—Johnson, J., Lower Broughton, and Andrew, E., Manchester, "*Improvements in metallic packings for pistons, air-pump buckets, valves, and other purposes.*" Patent dated Sept. 1, 1874.

This improved metallic packing consists of two taper eccentric rings which fit into each other, and are cut through in the thinnest part. The rings are nicked, or provided with grooves in the direction of the axis, the grooves diminishing in depth as they approach the thin part of the rings, which render the packing-rings elastic circumferentially, and thus ensure a good fit of the piston to the cylinder. The end pressure of the packing is obtained by the taper of the rings. A pin passing through the outer ring holds the inner ring, thereby preventing it getting out of place.

2989.—Foster, J. K. J., Horbury, Yorks, "*Improved apparatus for extinguishing fire, applicable also for distributing water for other purposes.*" Patent dated Sept. 1, 1874.

In this apparatus the water is forced under pressure through pipes into a receptacle or receptacles containing chemicals, in contact with which carbonic acid gas is generated; this is absorbed by the water, which is then passed to another vessel, and discharged through a suitable hose. The apparatus is arranged for charging the water with gas to any extent, or plain water only may be discharged.

3047.—Johnson, J. H., Lincoln's Inn Fields, London, "*Improvements in apparatus for compressing gaseous fluids.*" A communication. Patent dated Sept. 4, 1874.

This invention, relating to pumps or apparatus to be employed for the purpose of compressing air or gases to any desired pressures, consists in compressing the air or gas by the intervention of a piston or body of water, or other suitable liquid, so that at every stroke of the actuating piston a fresh quantity of water or other liquid is drawn in, which forms an effectual cooling medium for the air or gas in its traverse whilst being compressed. This entirely obviates injurious spaces. It further consists in the employment of a film or body of liquid, which is maintained at a constant level at the joints for the purpose of preventing any leakage or escape of the air or gas which it is required to compress.

3058.—Lake, W. R., Southampton Buildings, London, "*Improvements in portable hydrogen and carburetted hydrogen gas apparatus.*" A communication. Patent dated Sept. 5, 1874.

This invention consists—first, in the combination of a portable frame or base, with a hydrogen gas-generator, carburetter, and condenser; secondly, in a tubular boiler having hollow trunnions in combination with a casing and lining; thirdly, in the combination of boilers, with pipes for obtaining a circulation of water between the boilers; fourthly, in the combination with the case and end-plates of sectional fire-clay lining and tiling; fifthly, in a perforated fire-clay cylinder, conical cylinder, and pipe, in combination with the fire-box and ash-pit; sixthly, in dampers and flues, formed by the tiling in combination with the chambers of the gas apparatus; seventhly, in the employment of doors in combination with the sectional fire-clay lining of the case; eighthly, in the employment of a safety stop-cock in combination with a gas-generator; ninthly, in the arrangement of a pipe for conveying gas to the cylinder, in combination with the pipe for bringing gas from the retort, and with the engine and its steam-pipe.

3069.—Druce, F. H., Spitalfields, London, "*Improvements in double-acting apparatus or machinery to be used for discharging or ejecting water and other liquids.*" Provisional protection only obtained. Dated Sept. 7, 1874.

This apparatus consists of two cylinders or barrels open at the top, and having in them pistons or plungers, connected by rods to a beam, or jointed to main

frames or standards. At the bottom of each cylinder there is a disc-valve working in a valve-box, and the two cylinders communicate with each other by a horizontal tube or pipe, having in the middle a covered chamber; the pipe having at each side seatings for a disc-valve, and the chamber is covered with a cap, having a neck to which the hose is attached.

3070.—Whitworth, J., Royton, Lancs, "*Improvements in the construction of lamps for lighting gas.*" Provisional protection only obtained. Dated Sept. 7, 1874.

This invention relates to the construction of safety hand-lamps for lighting the gas in places where there is danger of fire; the object of the invention being to protect the flame from contact with any extraneous matter, and at the same time to afford a greater facility for lighting the gas without explosion or waste thereof, and to prevent the waste of oil occasioned by the necessary tilting or inclining of the lamp as ordinarily practised.

3082.—Cooper, W., Southampton, "*An improved rotary steam-engine and pump.*" Patent dated Sept. 8, 1874.

This engine, applicable also as a pump, consists of a drum or cylinder having thereon a central shaft or axis, upon which is keyed a rotary disc having upon it a scroll. This scroll is recessed; at and in such recess is a hollow packing or cod piece, having within it a spiral or other spring, the object of which is to keep the packing piece close up to the inner periphery of the drum during the travel or rotation of the disc. Steam, upon being admitted by the valve, pressing upon the enlarged end of the scroll, forces round the disc, the steam being used expansively for about half the travel of the disc. The curve or taper of the scroll gradually closes the valve until the scroll has passed the exhaust, when by the conformation of the end of the scroll and that of the upper part of the valve, steam is again admitted to renew the rotary motion.

The valve is entirely independent of any mechanical arrangement, being kept up to its place by steam alone, the pressure of which can be adjusted by a cock on a small drain-pipe; the whole number of working parts is thus reduced to two—namely, the scroll disc, piston, and the valve.

3095.—Rowbottom, J., Halifax, "*Improvements in retorts and in means or apparatus for charging and discharging the same.*" Patent dated Sept. 9, 1874.

The first part of this invention relates to the mouthpieces and doors of retorts, and consists in constructing them with a water space in such manner that water may be caused to circulate therein and thereby keep the jointing cool, so that any ordinary packing may be used for making gas-tight joints without the aid of clay or other plastic material now is use. The door and the cross-bar are also hinged to the mouthpiece in such manner as to admit of a lateral movement thereof, whereby the opening and closing for charging and discharging is greatly facilitated.

2. It relates to mechanical means and apparatus for charging and discharging or feeding in the fuel and removing the coke by the same apparatus. This consists of a receiver of suitable form and size to contain a proper quantity of fuel for one charge or supply. This receiver is fixed on a slidable arm capable of being operated by rack and pinion, screw, or other mechanical means. The arm is fitted and moveable in a slide bed carried on framework, or a carriage which is mounted on wheels arranged to run on rails laid for the purpose in front of the retorts. The arm is capable of being moved from one retort to another as required by racks and pinions or other similar means. On the framework or carriage is also fixed a hopper having a recess therein of capacity sufficient to contain one charge of fuel, so placed and arranged that the receiver may be brought under the recess in the hopper to receive its supply of fuel, the recess being provided with a valve or moveable bottom to allow the fuel to drop through a moveable aperture into the receiver. This receiver is provided at its outer end with a hinged door which acts to keep in the fuel while being pushed into the retort, and at the same time as a pusher to force the coke out at the other end of the retort, and at the return stroke allows the fuel to pass out of the receiver, the other end of which is provided with a stop-piece which is held fixed in position, so that on the return or back movement the stop-piece holds the fuel which forces the door open.

3. The invention relates to means of cooling and carrying away the coke, which consists of an endless creeper or chain of buckets, one end of the creeper working in a cistern of water so placed that the coke will fall from the retort into the water in the cistern and upon the creeper which will convey the coke to a waggon, cart, or other receptacle.

APPLICATIONS FOR LETTERS PATENT.

2000.—Schüssler, C. F., Hamburg, Germany, "Improvements in hydrocarbon gas apparatuses." June 1, 1875.

2016.—Bruce, De V., and Antisell, T. M., San Francisco, U.S.A., "An improved engine for utilizing the expansive force of vapours or gases either by gradual pressure or explosion." (Complete specification.) June 2, 1875.

2017.—Crease, J. F., Southampton, "Improvements in the construction of filters." June 2, 1875.

2026.—Blake, J. W., Jersey, U.S.A., "Improvements in steam-pumps." A communication. June 2, 1875.

2030.—Dykes, W., and Scott, J., Glasgow, "Improvements in taps or valves for controlling the flow of liquids or fluids." June 2, 1875.

2046.—Lake, W. R., Southampton Buildings, London, "An improved method of and apparatus for treating foul or noxious gases and vapours to prevent their contamination of the atmosphere, and to utilize them for various purposes." A communication. June 3, 1875.

GRANTS OF PROVISIONAL PROTECTION.

1625.—Pape, T., Nottingham, "An improved method of and apparatus for filtering and deodorizing sewage so as to prevent rivers being polluted thereby." May 3, 1875.

1790.—Jameson, J., and Schaeffer, A. G., Newcastle-upon-Tyne, "Improvements in centrifugal pumps." A communication. May 13, 1875.

1799.—Walkington, W., Leeds, "Improved automatic adjusting and deodorizing apparatus to be applied to closet-lids." May 14, 1875.

1809.—Prior, M., Sheffield, "Improvements applicable to compensating safety metallic pistons, valves, and anti-galvanic lubricant for same, applicable more especially to steam, water, air, or gaseous engines, to stuffing-boxes, to circular or piston valves, and to air and water pumps." May 14, 1875.

1813.—Cross, B. C., Surrey, "Improvements in ventilators for sewers and drains." May 15, 1875.

1815.—Louttit, K. M'L. P., Greenwich, London, "Improvements in the construction of lamps, applicable also for heating purposes." May 15, 1875.

1816.—Wallace, J., Durham, "A new and improved pump for pumping water, air, or gases." May 15, 1875.

1845.—Anderson, M. F., Edinburgh, "Improvements in the treatment of sewage." May 19, 1875.

1848.—Clark, A. M., Chancery Lane, London, "Improvements in the method of impelling, conducting, or forcing air by the influence of a jet of air or steam, and in applying the same to various purposes." A communication. May 19, 1875.

1857.—Tylor, A., Newgate Street, London, "Improvements in apparatus and arrangements for controlling, arresting, measuring, and recording the flow of liquids and fluids, and preventing the escape and waste of the same." May 20, 1875.

1870.—Hughes, R. H., Hatton Garden, London, "Improvements in self-acting valves." May 21, 1875.

1872.—Bablon, V., Paris, "Improvements in photometers or photo-phlogometers for measuring the intensity of the lighting power of gas in accordance with the size of the flame." May 21, 1875.

1888.—Clark, A. M., Chancery Lane, London, "Improved processes for the manufacture of ammoniacal salts, and more particularly the sulphate of ammonia." A communication. May 22, 1875.

1891.—Woodall, C., Vauxhall, and Wills, T., Brixton, London, "Improvements in the means of and apparatus for the purification of gas." May 24, 1875.

1895.—Hills, F. C., Deptford, London, "Improvements in the purification of gas, and in the preparation of materials to be used in the said purification." May 24, 1875.

NOTICES TO PROCEED.

261.—Colebrook, C. T., Islington, London, "Improved means or apparatus for raising water from wells or other places, or for raising other liquids." Jan. 23, 1875.

265.—Mills, E. C., and Haley, H., Gorton, Lancs, "Improvements applicable to motive-power engines, worked by the explosion of gas." Jan. 23, 1875.

269.—Allen, W., Manchester, "Improvements in machinery for raising and forcing fluids and liquids." Jan. 23, 1875.

294.—Cannon, W. G., Southwark, London, "An improved cup and ball joint for gas pendants and chandeliers." Jan. 26, 1875.

360.—Lambert, C., Hull, "Improvements in filters or apparatus intended chiefly to clear rain water, during its flow from roofs to reservoirs." Jan. 30, 1875.

417.—Chameroy, E. A., Paris, "Improvements in cocks for water, steam, air, or gases." Feb. 4, 1875.

439.—Wirth, F., Frankfort-on-the-Maine, Germany, "Improvements in valves." A communication. Feb. 5, 1875.

492.—Jones, H. L., Holborn, London, "Improvements in solid and liquid disinfectants and deodorizers." Feb. 10, 1875.

678.—Wirth, F., Frankfort-on-the-Maine, Germany, "Improvements in stop-valves." A communication. Feb. 24, 1875.

892.—Taylor, F. B., Bayswater, London, "An improved steam-engine, also applicable for use as an air, water, or other fluid motor." March 10, 1875.

1172.—Hogg, J. B., Edinburgh, "An improved gas-torch or fire-lighter." April 1, 1875.

1226.—Abel, C. D., Chancery Lane, London, "Improvements in locomotive engines worked by compressed air, and in pressure regulating apparatus for the same, such apparatus being also applicable for regulating the pressure of steam or gases employed in other engines." A communication. April 5, 1875.

1424.—Diplock, S., Tollington Park, London, "Improvements in apparatus for ascertaining the temperature of fluids contained in pipes, boilers, or other closed vessels." April 19, 1875.

1499.—Buchan, W. P., Glasgow, "Improvements in ventilating the soil and waste-water pipes and drains of houses, and in the construction and fitting of water-traps or apparatus for the said purpose." April 23, 1875.

1567.—Payton, W., Shelgate Road, and Holmes, J. E., Bayswater, London, "Improvements in engines to be actuated by steam, air, or other fluid, also applicable for raising and forcing liquids." April 29, 1875.

1581.—Goddard, B., Southport, Lancs, "Improvements in taps or valves." April 29, 1875.

1642.—Lomax, G. H., Massachusetts, U.S.A., "Improvements in lamps." May 3, 1875.

1662.—Buchan, W. P., Glasgow, "Improvements in water-closets." May 4, 1875.

1729.—Gordon, J., Glasgow, "Improvements in waste-preventing stop-cocks or valves." May 10, 1875.

1762.—Munro, W., Glasgow, "A new or improved pump for forcing water, which may be used for extinguishing fires or for other purposes." May 11, 1875.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

1882.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in lamps and lamp-burners." A communication. May 22, 1875.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3917.—Preston, F. P., Prestige, J. T., and Preston, E. J., Deptford, London, "Improvements in pumps." Nov. 13, 1874.

3928.—Richards, W., Brixton Road, London, "Improvements in instruments for measuring fluids." Nov. 14, 1874.

3960.—Hulme, R., and Lund, E., jun., Salford, "Improvements in pumps." Nov. 17, 1874.

3997.—Robinson, J., Stafford, "Improvements in apparatus for charging gas-retorts." Nov. 21, 1874.

4027.—Harrold, W., Stafford, "Improvements in gas-stoves." Nov. 24, 1874.

4158.—Goodall, R., Leeds, "Improved means or method of clarifying impure water or sewage, and preparing the precipitate or sludge for re-use." Dec. 3, 1874.

4162.—Clark, A. M., Chancery Lane, London, "Improvements in the musical instrument known as the pyrophone." A communication. Dec. 3, 1874.

4189.—Willans, P. W., Blackheath, London, "Improvements in hydraulic engines and pumps." Dec. 5, 1874.

4213.—Ashworth, G., and Ashworth, E., Manchester, "Improvements in steam-pumps and pumping-engines." Dec. 8, 1874.

4227.—Sugg, W. T., Westminster, London, "Improvements in gas-burners, parts of which are applicable to other gas-fittings, and in the method of constructing and manufacturing the same." Dec. 9, 1874.

4290.—Verdier, C., Paris, "An improved water-meter and feeder apparatus for boilers." A communication. Dec. 12, 1874.

4387.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in the manufacture of hydrogen gas, and in the utilization of the bye or secondary products obtained in such manufacture." A communication. Dec. 21, 1874.

400.—Johnson, R., Bradford, "Improvements in machinery for obtaining motive power for raising, forcing, and exhausting fluids and liquids, and for measuring liquids." Feb. 3, 1875.

737.—Keirby, J. E., Swinton, Lancaster, "Improvements in elastic and other packings for pistons and piston-rods of steam-engines, pumps, rams, and other similar purposes." March 1, 1875.

797.—Elborough, C. M., King's Arms Yard, London, "An improved meter for liquids." A communication. March 4, 1875.

862.—Mann, W., Blackfriars Road, and Owens, S., Whitefriars Street, London, "Improvements in valves." March 9, 1875.

984.—Phillips, W., Sheffield, "Improvements in water-closets." March 17, 1875.

1029.—Burney, G., Millwall, London, "Improvements in tank filters, part of which improvements is applicable for attachment of cement to other metal surfaces." March 20, 1875.

1077.—Challender, J., Manchester, "Improvements in apparatus for illuminating public clocks, which improvements are also applicable to other illuminating purposes." March 24, 1875.

1058.—Walker, W. T., Highgate, London, "Improvements in centre-valves." March 23, 1875.

1333.—Lillie, J., Manchester, "Improvements in apparatus for regulating, measuring, and registering the flow of liquids." April 13, 1875.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1316.—Fielding, J., "Improvements in steam and water rotary engines, applicable also for pumping purposes." May 1, 1872.
1327.—Christy, T., "Improvements in the treatment of ammoniacal and other liquor of gas-works, sewage, and other waters containing foreign matters in suspension in solution in order to obtain useful products therefrom." May 2, 1872.
1362.—Fish, R., "Improvements in the method of and apparatus for revivifying materials used in the purification of gas." May 4, 1872.
1391.—Fleury, F. G., and Tylor, A., "Improvements in apparatus for measuring and recording the flow of liquids or fluids." May 7, 1872.
1394.—Danchell, F. L. H., "An improved filtering medium." May 7, 1872.
1414.—Ross, W., "Improvements in water-closets." May 9, 1872.
1438.—Preston, F. P., Prestige, J. T., Preston, E. J., and Prestige, W. A., "Improvements in apparatus for regulating the supply of water to water-closets and other places." May 11, 1872.
1456.—Clark, W., "An improved method of extracting anthracene contained in coal tar, and the pitch accruing therefrom, without either carbonizing or decomposing the pitch." May 13, 1872.
1461.—Fearnley, W. G., "Improvements in apparatus for making illuminating gas, heating apartments or chambers, and other purposes." May 14, 1872.
1492.—Christy, T., and Borrownicki, A., "Improvements in the treatment of ammoniacal liquors of gas-works in order to obtain valuable products therefrom." May 16, 1872.
1500.—Lake, W. R., "Improvements in apparatus for preventing the escape of foul air and gas from drain-pipes." May 16, 1872.
1545.—Messenger, T. G., "Improvements in the coupling of pipes and in the fittings thereof, and in valves to use in connexion therewith, and for other similar purposes." May 21, 1872.
1558.—Soul, M. A., "A new or improved system of pumping apparatus for compressing atmospheric air or other gases." May 22, 1872.
1593.—Da Costa, L. A., and Lawrie, T., "Improvements in the construction of traps, waste plugs, or gullies for drains, and other conduits of water or other fluids." May 25, 1872.
1656.—Lake, W. R. "Improvements in metallic packing for making steam, air, gas, or water-tight joints." May 31, 1872.
1673.—Wentworth, S. T., "Improvements in burners for consuming gas and air combined." June 3, 1872.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

976.—Brönner, J., "Improvements in the construction of gas-burners." March 23, 1868.
1195.—Still, A. H., and Lane, D., "Improvements in the manufacture of gas." April 9, 1868.
1374.—Delperdange, V., "Improvements in the construction and modes of connecting pipes or tubes of metal, or other material." April 27, 1868.
1430.—Marlin, P., and Tack, A., "An improved process for transforming hydrocarbon oils into gas for illuminating and heating purposes." May 1, 1868.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

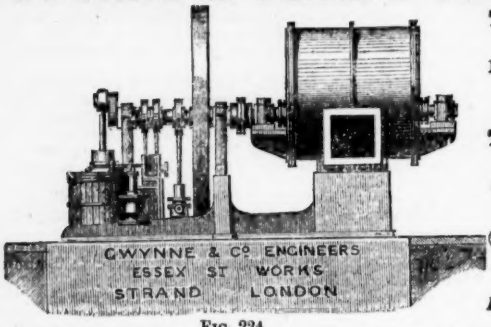


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.
Made under the personal superintendence of
Mr. BEALE,
The oldest Maker, Inventor and Patentee of
GAS-EXHAUSTING MACHINERY.
(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

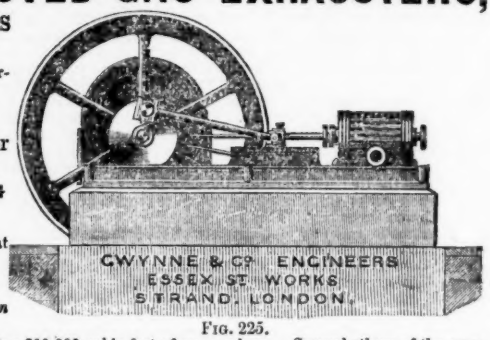
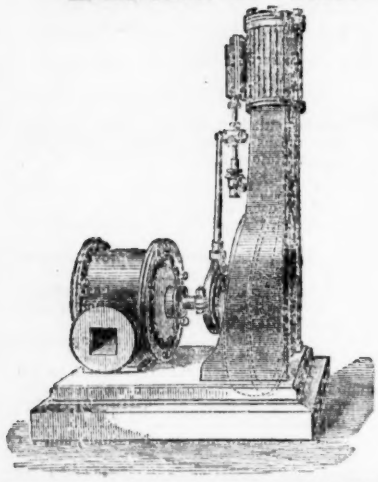


FIG. 225.

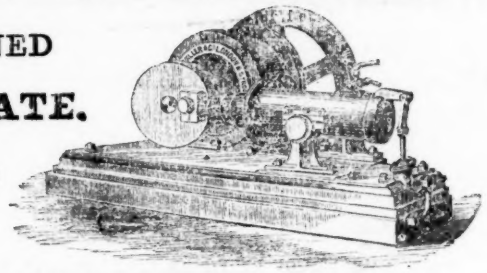
Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the most perfect system of action yet discovered. Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the excellence of the article produced, and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO
GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.
G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER



WITH
ENGINE COMBINED
ON
ONE BASE PLATE.
SOLE MAKERS,
GEORGE WALLER & CO.,
Who, since Mr. BEALE'S retirement, are the Oldest Makers.



EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

D. BRUCE PEEBLES & CO.,
ENGINEERS,
FOUNTAINBRIDGE WORKS, EDINBURGH,
MANUFACTURERS OF WET AND DRY GAS-METERS;
Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,
ABOVE 30,000 OF WHICH ARE NOW IN USE.
"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*
D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

WANTED, a Stoker. Constant employment; 29s. per week. Accustomed to manage an exhauster.

Apply, with copies of testimonials, to No. 169, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Draughtsman, one accustomed to a Gas Engineer's office preferred. State salary, age, and where last employed.

Address DRAUGHTSMAN, care of J. Westacott, Accountant, 51, Euston Road, N.W.

WANTED, a Working Engineer, to undertake the management of the Engines, the Reservoir, and the Mains of the High Wycombe Water-Works Company.

Applications, stating age and salary required, and full particulars, to be delivered to the SECRETARY of the Company, not later than Friday, the 25th of June.

WANTED, a Foreman Stoker. He must be steady and attentive, and have had practical experience in a Gas-Work.

Apply, by letter, stating age, where last employed, and what wages would be required, addressed to JOSEPH WOOD, Gas-Works, Bury, LANCASHIRE.

TO SULPHATE MAKERS.

WANTED, a Working Foreman, capable of taking charge of a small Sulphate Works and Tar Distillery. Good wages, with house and garden, to a competent man.

Apply, with terms and references, to No. 168, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a re-engagement as MANAGER, where the make is from 6 to 12 millions. The Advertiser has had 20 years practical experience in the erection, management, and distribution of gas. Five years foreman in erecting works (home and foreign). Eight years in last and present situation. Good references and testimonials. Aged 39.

Address No. 156, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-PURIFIERS.

WANTED, Four second-hand Gas-Purifiers, each about 7 ft. 10 in. by 6 ft.; 3 ft. high, with 8-in. connexions, containing 3 tiers of sieves with centre-valves. State lowest price.

Address THOMAS GLOVER AND CO., 214, St. John Street, CLERKENWELL.

TO GASHOLDER MAKERS.

WANTED, a Holder, 20 ft. diameter by 10 ft. deep, by best maker, complete with all apparatus, and three guide-columns.

For specification and particulars, apply to DAVID OLDFIELD, 7, Westminster Chambers, LONDON, after Thursday next.

NEW EDITION, NOW READY,

ADVANTAGES OF GAS FOR

COOKING AND HEATING.

By MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works, Lower Sydenham, London, S.E.

WANTED, a small second-hand Gas-HOLDER and TANK, from 10 ft. to 14 ft. diameter. Apply at EAGLE IRON-WORKS, Newbury, BERKS.

THE Advertiser, aged 28, having over eleven years experience in gas manipulation, desires a re-engagement, either as MANAGER or Assistant Manager in large works. Has lately returned from abroad, and has no objection to proceed abroad again. Good testimonials.

Address No. 159, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A 4-horse Engine and Ex-HAUSTER, to pass 10,000 cubic feet per hour. Self-acting bye-pass and two gas-valves, 8-in. connexions and exhauster governor.

For further particulars, or to view the same now working, apply at the GAS-WORKS, WALTON-ON-THAMES.

FOR SALE—A wrought-iron Purifier, with wood sieves, 8 ft. by 4 ft. by 3 ft. 6 in. deep. In good condition.

Can be seen, and particulars had, by applying at the Office of the Broadstairs Gas Company.

GAS APPARATUS FOR SALE.

THE Atherton Local Board have on Sale Four Dry-Lime PURIFIERS, 5 feet square, with cast-iron covers and lifting apparatus complete; centre-valve, with 8-in. inlet and outlet pipes.

Also, EXHAUSTER and ENGINE combined, by Musgrave and Sons, with 8-in. inlet and outlet pipes, two 8-in. changing valves, and bye-pass.

Further particulars on application to

D. SCHOFIELD, Clerk.

TO TAR DISTILLERS, &c.

THE Directors of the Wrexham Gaslight Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their works, for One, Two, or Three years, as may be agreed upon.

Particulars may be obtained upon application to the undersigned, to whom tenders must be sent on or before the 1st of July next.

THOS. WALKER, Secretary and Manager.

Wrexham, June 8, 1875.

FOR SALE.

THE Stoke Gas Company have for Sale a Telescope GASHOLDER of the following dimensions—viz., bottom lift, 42 ft. by 16 ft.; top lift, 40 ft. by 16 ft., with chains and balance-weights. It can be seen at the above company's works.

The holder to be taken down and removed at the expense of the purchaser.

Any further information with respect to same may be obtained on application to Mr. John M'MILLAN, the Company's Secretary and Engineer.

Wharf Street, Stoke-on-Trent.

THE St. Day Fire-Brick and China Clay Company, Limited, having largely increased their works, are now prepared to TENDER in any quantity for the supply of their well-known BRICKS and other FIRE GOODS, either for the Home trade or exportation. Prices and samples will be forwarded on application to the works, St. Day, CORNWALL, or the London Offices, 7, St. Bene't Place, GRACECHURCH STREET.

THE Scarborough Gas Company have FOR SALE, in consequence of removing to their New Works, a first-class Telescope GASHOLDER, 52 ft. in diameter and 44 ft. deep. It was made and erected by C. and W. Walker, of Donnington, in 1868, and is in excellent condition. It is of remarkably good workmanship, being perfectly circular and true, and free from all irregularities. The columns and girders are of handsome design and highest class of work.

Gas Companies wanting a good Gasholder this year will find this an advantageous opportunity.

For further particulars apply to

JAMES MOON, Gas Engineer, Scarborough.

TO IRONFOUNDERS.

THE Gas Committee of the Rochdale Corporation invite TENDERS for the supply of cast-iron GAS-PIPES, of 4, 5, 6, 18, and 20 in. diameter, in accordance with specification, which may be seen on application to the Engineer, Mr. Hunter, at the Gas-Works, Rochdale.

Tenders, endorsed "Gas-Pipes," must be delivered to me on or before the 6th of July, 1875.

The Gas Committee do not bind themselves to accept the lowest or any tender.—By order,

ZACH. MELLOR, Town-Clerk.

Town-Hall, Rochdale, June 18, 1875.

GAS TAR AND AMMONIA WATER.

THE Leek Improvement Commissioners invite TENDERS for the GAS TAR and AMMONIA WATER produced at their works, for One, Two, or Three years, from the 1st of July next. Make of gas about 30 million cubic feet per annum.

Tenders to state price per ton of 2240 lbs. at the works, or delivered into boat at canal wharf. They must be received on or before Monday, the 21st inst., at Four o'clock p.m., addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Tar, &c."

The Commissioners do not bind themselves to accept the highest or any tender.

Further information may be obtained from the undersigned.

C. HENSHAW, Clerk.

Public Offices, Leek, June 10, 1875.

GAS COAL WANTED.

THE Ludlow Union Gas Company are prepared to receive TENDERS for the supply of 400 tons of best GAS COAL, to be delivered, according to the Company's requirements, during the 12 months from the 1st of July next.

Tenders, stating price per ton delivered at Ludlow Station, to be forwarded to the SECRETARY, Ludlow Union Gas Company, Castle Street, LUDLOW.

TENDERS FOR GAS COAL.

THE Directors of the Glossop Gas Com- pany are prepared to receive TENDERS for a supply of CANNEL and COAL.

Particulars may be obtained on application to the undersigned, to whom tenders must be sent, not later than Saturday, the 3rd day of July next.

DAVID CLARKE, Manager.

Gas-Works, Glossop, June 17, 1875.

TENDERS FOR GAS COAL.

THE Directors of the Victoria (New- market) Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the supply of 1000 tons of best GAS COAL (21 cwt. to the ton), to be delivered at Newmarket Railway Station, in quantities of 100 tons in July and August, and 200 tons in September, October, November, and December next.

Tenders to be sent to the undersigned, on or before the 30th of June inst., to state the name and description of the coal, and to be endorsed "Tender for Gas Coal."

The Directors do not bind themselves to accept the lowest or any tender. By order,

THOMAS WILKINSON, Manager.

Gas Office, Newmarket, June 19, 1875.

TENDERS FOR GAS COALS.

THE Directors of the Slough Gas and Coke Company are prepared to receive TENDERS for a supply of 1000 tons (21 cwt. to the ton) of either of the undermentioned GAS COALS, viz:

New Pelton,
Holmside,
Ravensworth Pelaw, or
Best Screened Silkstone Brights,

delivered at the Slough Railway Station, in quantities of 100 tons in July and August, and 200 tons in September, October, November, and December next. Of course, parties may tender for either one, two, or the whole of the descriptions named.

Tenders to be sent to the undersigned, endorsed "Tenders for Gas Coals," on or before the 1st day of July next.

ARTHUR THOMAS, Secretary.

Slough, Bucks, June 9, 1875.

A. C. FRASER'S PATENT CAST-IRON RETORTS, introduced at over 200 Gas-Works, will last double the lifetime of the ordinary castings.

Apply to A. C. FRASER AND CO., Engineers, St. Stephen's Chambers, TELEGRAPH STREET, E.C.

A. C. FRASER & CO., Engineers and Contractors, St. Stephen's Chambers, TELEGRAPH STREET, E.C., undertake extensions of Gas-Works, Plant, Main-Laying, &c., employ first-class steady men only and will guarantee good sound workmanship at moderate charges.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

THE BRITISH ASSOCIATION OF GAS MANAGERS AND THEIR FRIENDS.

A First-Class PHOTOGRAPHIC GROUP of the above, 12 in. by 10 in.,

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JUNE 10, 1875.

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MESSRS. JOHN BETHELL & CO.,

(ESTABLISHED 1836,)

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MAKERS OF ANTHRACENE, CREOSOTE, &c.,

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GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

D. A. GRAHAM,

CONSULTING GAS ENGINEER,

STALYBRIDGE, NEAR MANCHESTER,

Erects Horizontal Condensers, Retort Settings, Pumps, Self-Acting Exhauster Governors, Coal-Testing Apparatus, &c., &c.

Gas-Works surveyed, mapped, and reported on, and extensions or alterations designed and the particulars specified, and work estimated for and executed.

D. M. NELSON,

48, GORDON STREET (late 135, BUCHANAN ST.),

GLASGOW.

Supplies every requisite in connexion with the distribution of Gas and Water.

Estimates and prices on application.

WOOD GRIDS for Purifiers and Scrubbers.

Cast-Iron PIPES and VALVES.

Street LAMP-PILLARS.

Patent Pipe SCREWING-MACHINES, &c.

Mr. ALFRED LASS,

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Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

WM. RICHARDS,

INVENTOR OF THE DRY GAS-METER,

REVISER OF "HUGHES ON GAS-WORKS,"

CONSULTING GAS ENGINEER,

Advises on all matters of business connected with Gas Lighting. Furnishes Working Drawings of Retort-Settings, Specification of Works, complete or in detail.

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TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, WESTMINSTER.

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16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000.

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine: (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

Just published, price 10s. 6d.,

REGISTRATION OF DISTRIBUTORY PLANT.

The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.

W. J. WARNER, Engineer.

South Shields.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.

JACKSON, FOX, AND ELLEN,
55, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

CATHELS'S Patent District Dry Gas- GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four- WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

WOLSTON'S TORBAY IRON PAINTS.

THE Torbay and Dart Paint Company, Limited, 23, Great George Street, Westminster, S.W., having been informed that PAINTS not manufactured by them are being offered to Gas Companies and the public as "WOLSTON'S," hereby give notice that they will TAKE PROCEEDINGS against any persons infringing their rights as sole proprietors and manufacturers of Wolston's Torbay Iron Paints.

(See Advertisement on another page.)

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE- DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

GARSIDE'S IMPROVED REGIS- TERED TUBE-VICE, holds all sizes of Wrought-Iron and Brass Tubes, from a 2-in. socket to the smallest brass tube made.

GARSIDE'S IMPROVED MAIN DRILLING CLIP, made in two sizes, to drill from 2-in. to 6-in. Mains, and from 6-in. to 12-in. Mains.

The above tools are made light and handy.

For drawings, &c., apply to the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, ½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices.

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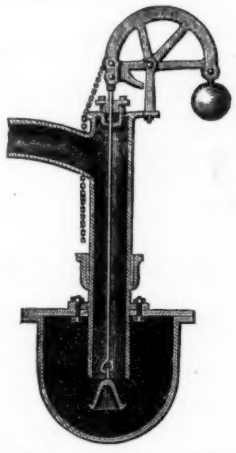

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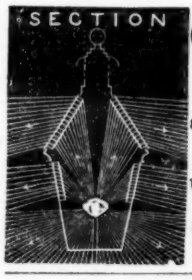

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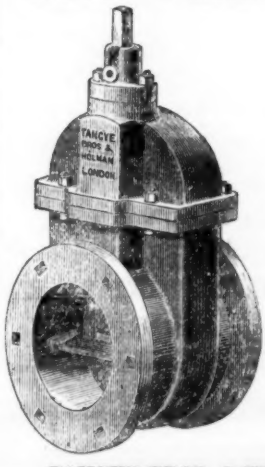

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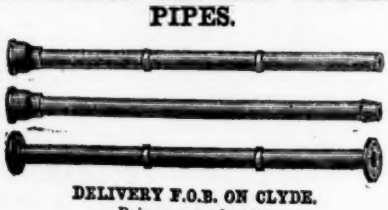

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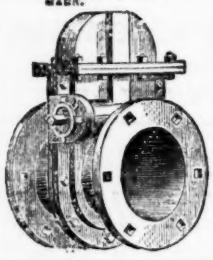

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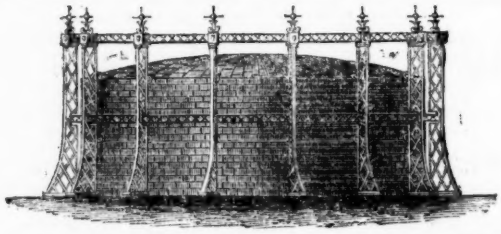

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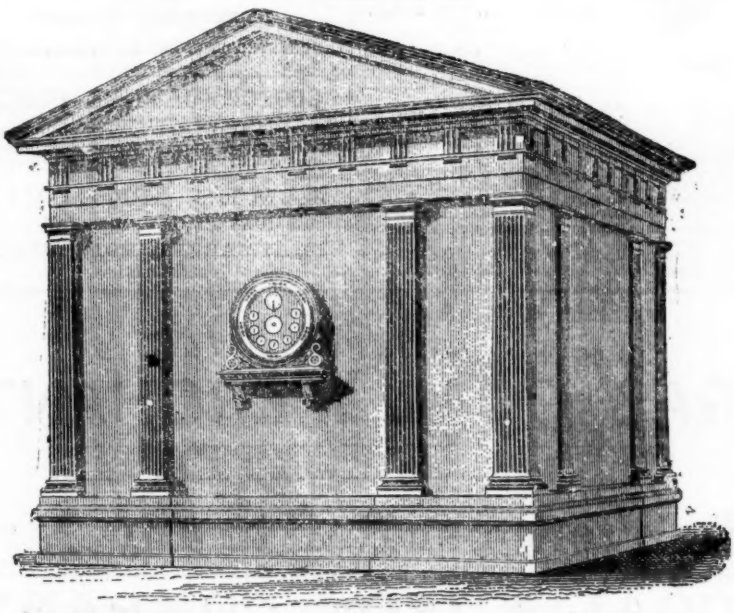

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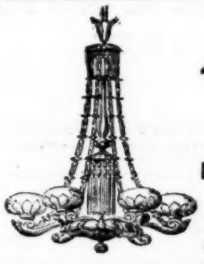

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Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

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Purified gas per ton of coal in cubic feet (average)	**10,775**
Weight of coke in lbs. per ton of coal	**1,465**

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1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

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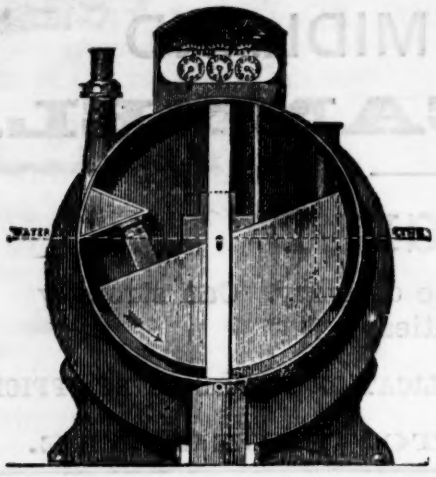

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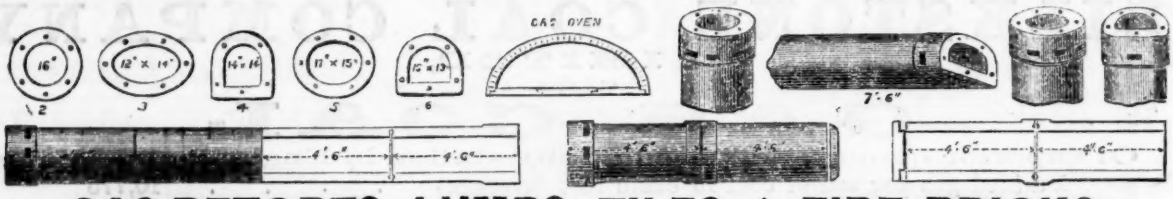

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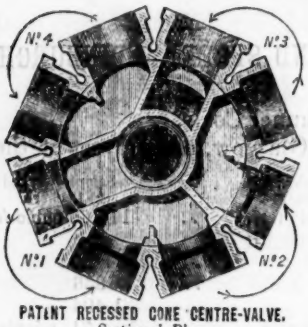

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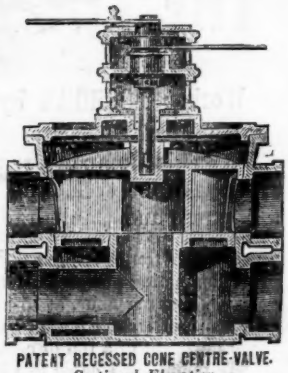

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